Multi-Stakeholder Consultation Session

on the

Proposed Expansion at Swan Hills

of the

Alberta Special Waste Treatment Centre

ALBERTA
SPECIAL WASTE
MANAGEMENT
SYSTEM
OPERATED BY CHEM-SECURITY (ALBERTA) LTD.

91-05010/

Report

from

Multi-Stakeholder Consultation Session

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I OVERVIEW OF MULTI-STAKEHOLDER MEETING

The following report is a detailed account of the Multi-Stakeholder Meeting which took place November 6, 1990 at the Convention Inn South in Edmonton. This meeting was one of the initial steps in an ongoing public consultation process Chem-Security (Alberta) Ltd. (CSAL) and the Alberta Special Waste Management Corporation (ASWMC) are conducting throughout the province.

The consultation process, which is a requirement of Alberta Environment, ensures public input into the proposed expansion of the Alberta Special Waste Treatment Centre near Swan Hills.

Representatives from CSAL and the ASWMC met with members of the Alberta Environmental Network, the Swan Hills Town Council and Citizens' Liaison Committee in October to discuss the public consultation program.

Plans for the initial phase of this program include: the Multi-Stakeholder Meeting and individual consultations with environmental groups, industry, health associations, aboriginal groups and other interested parties.

The purpose of these meetings is to have concerned groups and individuals identify issues they feel CSAL and its consultants should consider when preparing the Environmental Impact Assessment (EIA) for the proposed plant expansion.

Further public input will be sought once the Draft EIA has been completed and circulated to libraries and town offices throughout the province. A series of province-wide public meetings are currently scheduled for the spring of 1991.

Over 130 participants representing industry, industrial associations, academia, environmental groups, native communities, waste management study groups and the three levels of government attended the Multi-Stakeholder Meeting.

An information package containing: the Treatment Centre's current Environmental Protection Plan; the Draft Terms of Reference for the EIA; a description of the proposed Facility; and an outline of the EIA process was sent to those attending. Each person was asked to register in one of the following afternoon workshop sessions: Transportation; Air Quality; Vegetation, Soil, Land and Wildlife; Fish and Water; Socio-Economic; and Health Risk Assessment.

During the morning plenary, representatives from the Alberta Special Waste Management Corporation and Chem-Security (Alberta) Ltd. briefly addressed the following topics: Looking Back: Alberta Special Waste Management System Stewardship; The Need for Expansion; The Rationale for Increasing Incineration Capacity; and The Proposed Expansion. Technical presentations by the EIA consultants followed, covering the topics for discussion in the afternoon workshops.

The workshops were conducted by independent facilitators who guided the groups through discussions of:

- areas of agreement with the Terms of Reference
- concerns/deficiencies within the Terms of Reference
- and potential areas for further review.

The EIA consultants were available during the workshop sessions to answer questions.

Each workshop reported its major concerns at the closing plenary session.

Following the meeting, each facilitator prepared a report of their workshop which was then submitted to the appropriate EIA consultants for review.

Copies of these reports as well as the speeches and technical presentations given in the morning plenary session form the text of this report. Appendix A gives the Draft Terms of Reference for the Environmental Impact Assessment which participants were asked to review and Appendix B lists all participants.

This report will be sent to all those who were invited to the meeting and to anyone who expresses an interest in the proceedings.

II TEXT OF SPEECHES*

LOOKING BACK: ALBERTA SPECIAL WASTE MANAGEMENT SYSTEM STEWARDSHIP

Speaker: William K. Ross
Vice Chairman - ASWMC Board

Recognizing the Problem

The recognition of serious problems created by improper management of hazardous wastes in other parts of the world led to the Minister of the Environment establishing, in 1979, a Hazardous Waste Management Committee to study the subject. The committee held a number of public meetings and recommended that there was need for a special waste management system in Alberta.

In 1980 the Environment Council of Alberta held 16 hearings throughout the province of Alberta, each supported by an information meeting. Over 1,000 people attended the hearings. Their contribution was invaluable.

Waste Management System Recommended

In December of that year we published a report recommending the following:

> That an integrated system of collection, transportation and treatment be established in Alberta for the treatment and disposal of special wastes.

The system would include collection stations and a treatment plant with:

- Solvent Recovery by Distillation
- Chemical and Physical Treatment
- Incineration
- Solidification
- Secure Landfills
- Waste Water Management
  (Rain falling on active process areas would be directed to lagoons. From there it could be treated, if necessary, and directed along with treated process waste waters to Deep Well Disposal).

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* The following speeches are verbatim texts.

Site Selection

An implementation team was appointed by the Minister to continue the process. Fifty-three requests were received from centres in Alberta that consideration be given to locating the treatment plant in their "back-yard". A site near Swan Hills was selected.

ASWMC Established

The Government passed an Act in 1984 establishing ASWMC.

The Act states that the objectives of the Corporation are:

- to ensure the establishment of sufficient corporation facilities to deal adequately with hazardous waste that is not being adequately dealt with by other hazardous waste management facilities;
- to ensure that corporation facilities are established, operated and maintained in a manner that will protect the health and safety of the public and the environment;
- and to ensure that wherever practical, corporation facilities are established, operated and maintained by operators from the private sector.

Joint Venture Established

ASWMC entered into a joint venture with BOVAR Inc. to finance the system. They decided that CS(A)L, a wholly owned subsidiary of BOVAR, would design, construct and operate the treatment facilities. This gained the benefit of Chem-Security's expertise and experience in managing hazardous wastes.

Environmental studies were carried out of air, water, soil, vegetation and mammals on and around the site of the Special Waste Treatment Centre. A collection and transfer system was established. It involves a number of companies and organizations including the Alberta Special Waste Services Association.

All of the treatment processes described previously have ample spare capacity to meet the need of Albertans except incineration.

It was decided that incinerators would be added on a staged basis to ensure that they best met the needs of Albertans. Thus the provision of incinerator capacity is an on-going process.

Over 3,300 tonnes of liquid PCBs have been incinerated at an efficiency of destruction of 99.9999%. Thus Alberta is the only province in the happy position of being able to say it has virtually no accumulation of waste liquid PCBs. Three-thousand-seven-hundred tonnes of other toxic hydrocarbons have also been incinerated, so we are well on top of that situation.

Program Initiatives

The 700 pharmacies in Alberta initiated a program called the "Great Drug Round-Up" where people can bring their old medicines to their local pharmacy to be sent to Swan Hills for incineration.

We initiated a parallel program called the "Toxic Round-Up". Householders can bring their hazardous wastes to a collection point to be sorted and packaged in drums for transportation to Swan Hills to be incinerated. We told the towns and villages that they would have to choose and equip the collection sites and handle local publicity if they wished to participate. This year 124 centres said that they wished to participate and did a magnificent job of fulfilling their end of the bargain. Three-thousand-three-hundred drums of hazardous household wastes were collected.

4 Rs

We are strong supporters of the four Rs. Many attendees at the hearings expressed a concern about the hundreds of thousands of used pesticide containers scattered around the province. Alberta Environment collected them in selected landfills. The Crop Protection Institute of Canada set up a fund of $1.00 per container and turned these funds over to ASWMC. We contracted with private companies to triple rinse and shred the containers. The containers from the '87, '88 and '89 crop years, amounting to a total of 1.9 million containers, have been processed. The 800,000 containers from this year are being processed. The plan is to send the steel to a steel mill to be recycled. A plant is being built in Alberta to convert the plastic containers into clean, safe pellets to be used in the plastics industry.

ASWMC is working with a number of organizations and private sector companies to collect used oil and facilitate its recycling.

I look forward to your participation in this meeting to discuss the Draft Terms of Reference for the proposed expansion of incineration to meet the growing needs of Albertans. This will help us to continue to ensure that the public is well informed regarding our activities and allow us to benefit from an understanding of their concerns and ideas when formulating our plans to meet the needs of the future.

THE NEED FOR EXPANSION

Speaker: Ken Simpson
President - ASWMC

Key Issues

I would like to address the need for the expansion of the incineration capacity of the Alberta Special Waste Treatment Centre from a policy perspective. I will examine three key issues. First of all, are we encouraging the generation of hazardous waste in this province by expanding our treatment facilities? Secondly, why is the demand for treatment facilities growing in this province? And finally, does this proposed expansion herald the importation of wastes from other jurisdictions?

ASWMC Policy

Let me begin by stating that the policy of the Alberta Special Waste Management Corporation is first and foremost to reduce, reuse, recycle and reclaim as much waste as possible; and examples of this policy in action are the successful programs and toxic round-ups our Vice Chairman (Bill Ross) mentioned earlier.

Growing Demand for Waste Treatment

We know, however, after consulting independent market surveys estimating the quantity of hazardous waste generated in Alberta, that despite employing and encouraging the 4 Rs, the demand for waste treatment is growing.

Let's examine why. This demand is driven by two factors. The first is the proclamation and strict enforcement of environmental regulations.

For example, a major portion of Alberta's current three-to-five year backlog of waste resulted from the Hazardous Waste Regulation enacted in 1988. There is little doubt that the growing environmental awareness of waste generators and current legislative trends will lead to the identification of more waste requiring specialized disposal rather than less.

The second reason for the increased demand is the shift that has occurred in the type of waste streams requiring treatment. The actual volume of solid waste produced in the province has exceeded original estimates. The proposed expansion of the Treatment Centre would provide the necessary capacity to dispose of the solid wastes now being generated and the province's current backlog of waste.

Alberta Waste Only

Let me make it very clear that this proposed expansion is necessary to deal with Alberta's waste disposal needs only. Our Minister recently stated publicly that the issue of importing wastes from other jurisdictions is "off the table". He will not allow the importation of any wastes without first conducting a public consultation throughout the province.

Conclusion

In conclusion, let me say that there are those who feel the expansion of hazardous waste treatment facilities is tantamount to encouraging the production of wastes. I think in this case a comparison to a parallel situation in the health care field is appropriate. We all recognize the importance of the prevention of disease. But I think you would be hard pressed to find many prevention advocates who would endorse shutting down hospitals to promote their cause.

While we advocate and practice waste reduction, we realize hazardous waste has to be dealt with. New legislation and the strict enforcement of regulations will without a doubt increase the volumes of waste requiring special treatment in this province. The present proposed expansion is needed to deal with the new waste streams being identified and the current backlog of waste now stored throughout Alberta. Let me reiterate that this expansion is proposed to deal with Alberta waste only.

This province has proven to be a leader in the management of hazardous waste in Canada. We wish to remain in this leadership role and continue to do what others in this country have been attempting to do for many years.

Our approach has been to inform and involve the public at every stage of the process and that is why we are here today.

THE RATIONALE FOR INCREASING INCINERATION CAPACITY

Speaker: Joe Lukacs
President - Chem-Security (Alberta) Ltd.

As has been pointed out, the need for waste treatment is growing in Alberta. The present capacity of the Swan Hills facility cannot meet Alberta's current or estimated future needs. Chem-Security and the Alberta Special Waste Management Corporation have come to this conclusion based on surveys of the known backlog of wastes currently stored throughout the province and from studies estimating the ongoing generation of waste today and in the future.

This increasing need for more waste treatment was not a surprise. What was a surprise, perhaps, was how fast this need came to the surface.

Ken Simpson made reference to the increased regulations creating more need. As the operators of the system, we have observed other factors affecting the need for the increased capacity. One of these is the awareness of the significant liabilities facing companies when storing waste, i.e. the Saint-Basile-le-Grand PCB fire.

The second factor is the availability of the treatment centre itself. By virtue of the treatment centre being available, it now offers generators a viable option for the safe, permanent destruction and disposal of wastes.

The Backlog

Ever since the opening of the plant, we have carefully monitored Alberta's need for waste treatment, comparing our findings with the original marketing surveys. The most current and very conservative surveys indicate that the backlog of wastes awaiting incineration in Alberta totals about 90,000 tonnes. Of this amount, approximately 40,000 tonnes requires incineration at the Alberta Special Waste Treatment Centre.

The Ongoing Generation

Over and above this backlog, Alberta also generates approximately 50,000 to 60,000 tonnes of incinerable waste annually - 25,000 tonnes of this requires treatment at the Swan Hills facility. According to our projections, the annual volume of waste requiring treatment in Alberta will increase from this estimated 25,000 tonnes today to over 28,000 tonnes by 1993.

Projected Annual Need for Incineration

Taking into account the current backlog and the ongoing waste generation, we will need to treat between 40,000 to 45,000 tonnes of waste annually in the very near future to keep the waste under some control.

Today, the incineration capacity at the Alberta Special Waste Treatment Centre is in the order of 12,000 to 15,000 tonnes per year depending on the heating value of the waste. It is obvious, therefore, that the stockpiles of waste throughout the province will continue to grow unless the present treatment capacity is increased.

The Technology

I wish to reflect now on why we recommend incineration as the solution to the growing volumes of waste in our province.

To determine how best to meet Alberta's waste treatment needs, our engineers, in conjunction with the Alberta Special Waste Management Corporation, examined several options, including: waste storage, waste export, mobile incineration, and emerging technology such as infrared systems, biological treatment technology, soil washing, and other techniques presented to us by the suppliers of technology.

In addition, we are constantly monitoring state-of-the-art technologies, including new developments. We are being constantly bombarded by claims of new inventions - there seems to be no shortage of opportunists in this business.

Our technical and operating staff concluded that the expansion of our present incineration capacity would be the most effective and most reliable way to deal with the variety of waste streams requiring treatment.

Expansion Consistent With Plant Concept

As we go through today's process, it is important to recognize that Chem-Security's recommendations for the expansion of the Swan Hills plant is entirely consistent with the original plan developed in 1984/85. In 1984, when the treatment centre was being designed, there was considerable uncertainty about the volumes and the types of waste that would require treatment. The design of the treatment centre anticipated that modifications and additions would be required in the future. The centre was designed in such a way as to allow it to be expanded to accommodate new or changing waste streams and additional treatment processes.

Today, we know better what Alberta's need is and we know that the plant needs to be expanded to meet this need.

Known Technology

When we are considering expansion, it is comforting for us to know that we will be building on our extensive experience with incineration.

While the small units we built originally had limited use in the treatment of hazardous waste, the units we have reviewed for this expansion are larger in size and have been widely used by other facilities. These units have a more extensive operational history than our current incinerators.

Conclusion

The reason we are here today is because Alberta needs additional hazardous waste treatment capacity. Estimates of present and future waste treatment needs in Alberta indicate the need for an increased treatment capacity of between 40,000 to 45,000 tonnes annually.

The best solution for this need is to expand the incineration capacity at Swan Hills. This then would enable Alberta to clear away its present backlog and provide some reassurance that future needs for hazardous waste treatment in Alberta are met and we can remain environmental leaders in Canada.

THE PROPOSED EXPANSION

Speaker: Al Wakelin
Project Manager - Chem-Security (Alberta) Ltd.

The Proposed Expansion: Rotary Kiln Incineration System

As you have heard, we are seeking ways to respond to the demand for the treatment and disposal of special wastes within the province. I would very briefly like to review the following topics with you:.

- the options that have been assessed;
- the basis for the assessment of impacts;
- what is being proposed in our recommendation.

Options for Waste Treatment

In the analysis of the waste volumes that Chem-Security has carried out, we have looked at the total volume of waste production, the means by which this waste is presently being disposed of and the alternate ways in which the backlog of waste might be disposed of.

We used a matrix to evaluate each of the treatment options in terms of the following criteria:

- availability of proven technology;
- verifying the results of the treatment;
- potential long term liability;
- cost of treatment;
- environmental impact.

The ranking of various alternatives can be displayed in tabular form and the following table evaluates the options for organic sludges. In a similar manner, liquids and contaminated solids can also be evaluated.

Ranking Scale
1 = not preferred
6 = preferred

COMPARATIVE EVALUATION OF TREATMENT
TECHNOLOGIES FOR
ORGANIC SLUDGES

	Flexibility	Environmental Impacts	Treatment Cost	Long Term Liability	Verification of Results	Relative Rating
Landfarming	6	1	6	1	1	15
Stabilization /Landfilling	3	6	2	5	4	20
Incineration	4	5	4	6	5	25
Fuels Program	1	4	5	3	2	15
Biological Treatment	2	2	3	4	3	14
Storage	5	3	1	2	6	17

Environmental Impact Assessment

The main reason we are here today is to allow us to benefit from your input into the assessment of the impacts of our proposal. The impacts of any proposal result from both the obvious and the not so obvious pathways that exist. We have quite recently come to recognize the small but detectable impact that routine operations within the plant site can have as shown on the illustration on following page.

We have accordingly requested our consultants to consider these environmental impacts and also the socio-economic impacts, especially on the Town of Swan Hills, and the impacts on other communities from transportation of waste, for example.

Rotary Kiln Incineration System

As a result of our studies, Chem-Security is recommending that a rotary kiln incinerator with a capacity of about 40,000 tons per annum be installed.

It is not the intention to provide a lot of technical details about the incinerator today, but it is important that you know in general terms what is being proposed. I also want to talk about some of the other factors that have to be included, such as the expanded infrastructure needed to accommodate the proposed site expansion.

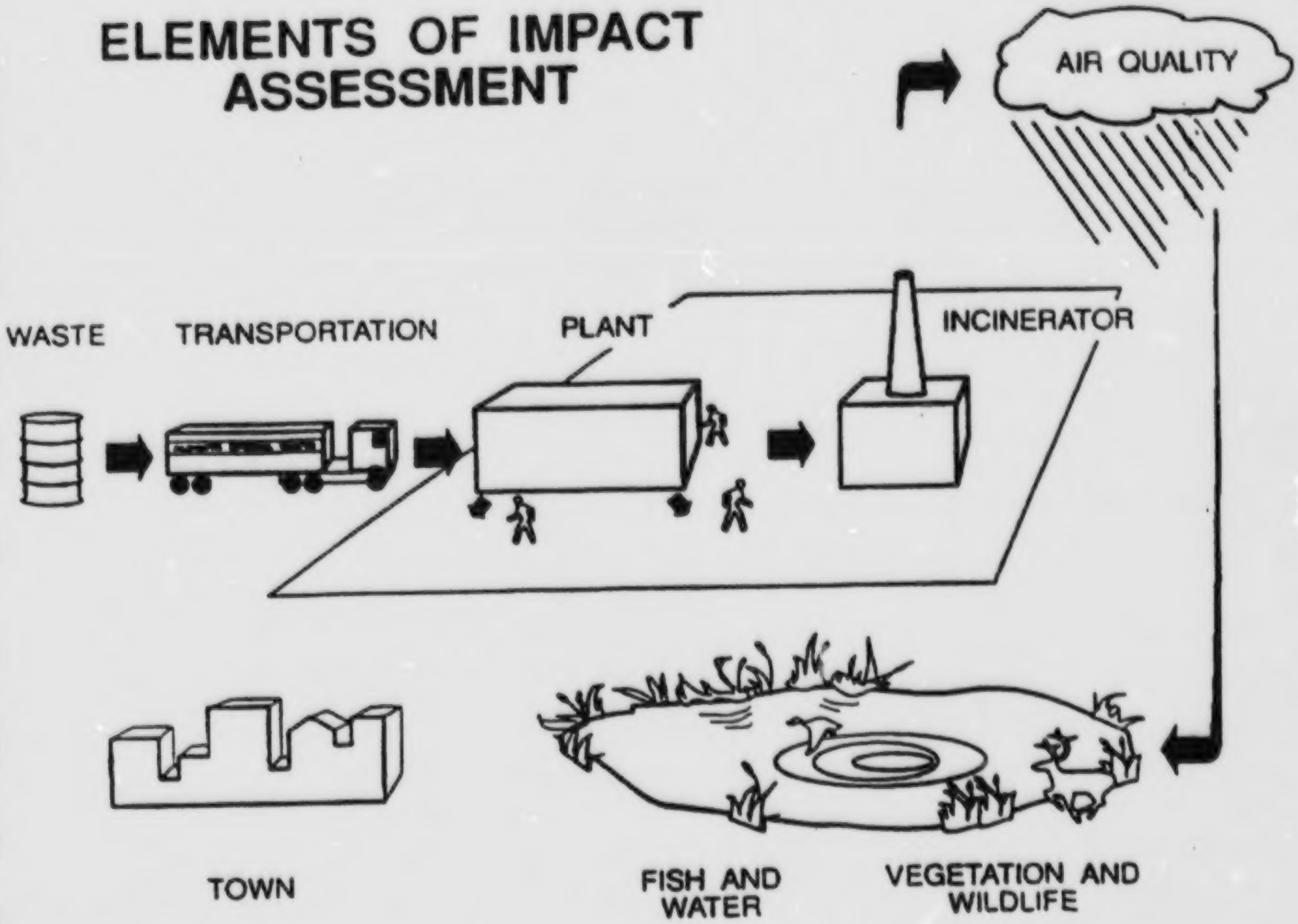
What we are proposing is an incinerator with some very sophisticated features such as:

- an enclosed waste receiving and feed system;
- a two-stage incinerator comprising a rotary kiln and a secondary combustion chamber;
- a multi-stage air pollution control train to remove particulates and acid gases;
- there will be no liquid effluent.

In terms of performance, the system will be capable of meeting emission limits which are generally one-half of those presently required in Alberta.

The proposed technology and equipment will be that which operating experience has adequately demonstrated to be the best available.

ELEMENTS OF IMPACT ASSESSMENT


AIR QUALITY
WASTE
TRANSPORTATION
PLANT
INCINERATOR
TOWN
FISH AND WATER
VEGETATION AND WILDLIFE

Expanded Infrastructure

We also are reviewing and assessing other components of the overall system such as:

- staff to operate the facility;
- transportation network;
- emergency response capability;
- monitoring programs;
- operating policies and procedures.

Emissions

Finally, I want to mention a couple of items about which you will be hearing more today.

You will hear the term fugitive emissions.

This is a very general term used to represent emissions from activities such as waste handling at the site. While considerable effort is put forth to eliminate these emissions, it is nevertheless possible to detect some compounds both on and off site. We are very cognisant of this and will be including this in our impact assessment.

You will also hear about stack emissions or products resulting from the incineration process which are emitted to the atmosphere. These emissions form a very essential component of the resulting impact studies and have been chosen very carefully to represent a conservative view of such emissions.

We will, of course, be glad to discuss these in more detail, if you wish, at the workshop sessions.

SUMMARY OF ENVIRONMENTAL PROTECTION

Speaker: Jay Nagendran
Manager, Environment - ASWMC

Reports from seven qualified individuals who represent seven diverse and well reputed consulting firms will follow. In addition, you have heard from a very qualified project team who, by virtue of operating the only fully integrated special waste treatment facility in North America, has experience second to none.

I want to take a few minutes this morning to summarize the:

A) comprehensiveness of the monitoring program;
B) results of monitoring and its implications;
C) our desire to continue our leadership position in the area of special waste management.

A) Comprehensiveness of the Monitoring Program

Alberta put itself in the unique position of having a publicly accepted site and facility for special waste because, as stated before, we went through a process of extensive public consultation long before such consultation was an expectation or a requirement in this province. Such consultation led the Alberta Special Waste Management Corporation to implement a comprehensive environmental monitoring program including air, soil, vegetation, surface water, ground water, aquatic life and wildlife.

Within each of these categories several sub-components are monitored for numerous chemical parameters. For example, soil and vegetation are monitored at between 20 and 40 sites. The soil is monitored at varying depths from the surface to one meter. The vegetation includes labrador tea, black spruce, pine, moss and lichens. The chemical parameters include a whole variety, encompassing organics, inorganics, heavy metals, chlorinated compounds, and so on.

The ASWMC spends more than $1.5 million annually on its monitoring programs.

B) Results of Monitoring and its Implications

In the early years (from 1985-1987 before the plant was built), background data was collected and stored for future reference. In the latter years, the integrated nature of the monitoring program was used to calibrate and fine-tune the usefulness of the program. For example, air quality model predictions were used to identify potential areas of impact, so that the monitoring can concentrate on the impact zones. Subsequently, actual field monitoring data was used to calibrate the air quality model to make the predictions even more accurate.

It was our hope that such a program will ensure that the treatment centre is operated safely and will also act as an early warning system should there be any deviation from background levels. The wisdom of our approach did indeed provide an early warning system which identified PCBs in wildlife and vegetation.

Upon confirmation of the presence of PCBs in the vicinity of the plant area, the plant hired a leading toxicologist to assess the potential impacts on the health of large animals and humans. Dr. Willes concluded that the levels present did not pose a health hazard to wildlife or humans. In addition, based on air modelling and incineration stack emission monitoring, it was further concluded that the measured PCBs were a result of vapours and fumes that are present during normal handling practices such as opening barrels and moving them within the plant site, rather than from the incinerator stack (these vapours and fumes are usually referred to as fugitive emissions). The plant proceeded to do a complete audit to identify the sources and immediately began a program of corrective actions.

These findings have had a positive impact on the design of the proposed expansion.

It is worth noting that fugitive emissions are common in normal handling and storage practices of many types of wastes, further emphasizing the need to collect and treat special wastes rather than indefinitely storing them, which is what will happen without an expanded facility.

C) Openness and Desire to Continue Leadership Position

The information collected at the treatment centre is shared with regulator authorities which license the plant, the consultants for the Town of Swan Hills, its liaison committee, as well as the 15,000 Alberta readers of the Treatment Centre newsletter, Site Line, and the 1,500 people from around the world who visit the plant annually and receive Site Line.

We are committed to continued openness and dialogue with Albertans, and intend the ASWTC to remain a first class facility with its unprecedented environmental monitoring that is a model for others around the world.

We are truly proud of what we are doing and we extend our gratitude to you for your willingness to share your thoughts and be part of this vital Environmental Impact Assessment process.

III TECHNICAL PRESENTATIONS

TRANSPORTATION

EIA Consultant: **Brian Griffin**
Bercha Group

The planned increase in processing capacity at the Swan Hills Treatment Centre will result in increased volumes of special wastes being transported from generators throughout Alberta to Swan Hills. In order to assess potential changes in transportation risks associated with the planned expansion, the existing transportation risks were analyzed in addition to the incremental effects associated with the expansion facilities.

Vu-Graph 1: Special Waste Transportation Routes*

Special waste trucks originating throughout Alberta finally converge on one of the routes in the region between Edmonton and Swan Hills as shown in this vu-graph. Routes I, II, and III shown in this figure presently comprise the highest volume of special waste traffic to Swan Hills. The greatest volume of special waste is transported along Route I and therefore this route received the more detailed analysis.

Vu-Graph 2: Regional Traffic Volume

Vehicle and truck traffic in the high density, special waste traffic region is shown in this vu-graph. For each of the principal roadways a symbol is shown identifying the average annual daily traffic for both all vehicles and for trucks separately. As may be seen, the volume of truck movement is approximately 15% of all vehicle movements throughout the region except for Highway 16 where it bypasses 16X.

Vu-Graph 3: 1989 Distribution of Special Waste Traffic

The present distribution of special waste traffic is summarized in this vu-graph according to the category of shipment and the transportation route previously identified. Shipments have been categorized according to those containing liquid and solid drums, bulk solids, and bulk liquids. As may be seen, Route I accounts for 85% of the total number of shipments.

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* The graphs referred to follow the written text.

Vu-Graph 4: Segment Accident Rates for Route I

A risk analysis was carried out to estimate the accident probabilities and consequence severity for transporting present volumes of special waste in addition to the planned expansion volumes of special wastes. Generally, truck transportation hazards are associated with an accident, a spill, or both. An accident analysis was carried out on present special waste traffic in order to estimate the public risk associated with the accident itself or with a spill resulting from an accident. The historical accident rates calculated for different segments of Route I are identified in this vu-graph. These accident rates for all vehicles vary from about 0.6 to 1.2 per million vehicle kilometres. The average Route I accident rate is about 0.8 mvk which is much less than the average rate on a provincial wide basis.

Vu-Graph 5: Contributing Factors in Accidents Involving HAZMAT Trucks

A number of causal factors resulting in HAZMAT (hazardous material or special waste) truck accidents were analyzed based on Alberta data. As shown in this vu-graph, casual factors have been generally distributed according to four major factors; namely, driver action, driver impairment, vehicle factors, and environmental factors. Sections of the pie chart given in these overhead have been cut out to represent the potential reduction in accident causal factors due to the Special Wastes Safety Program. For example, the driven impairment factors have been reduced 25% due to the impact of programs to eliminate driver fatigue.

Vu-Graph 6: Percent Distribution of Today's Special Wastes by Dangerous Goods Classification

The special wastes transported to Swan Hills were analyzed according to dangerous goods classification as shown in this vu-graph in order to determine which portion may be associated with more serve spill consequences. As may be seen, only 11% of the total shown by the cut-out portion of the graph is associated with special wastes which may be considered as having the potential for more serious consequences.

Vu-Graph 7: Special Wastes Traffic Comparison Between Existing and Expanded Facilities

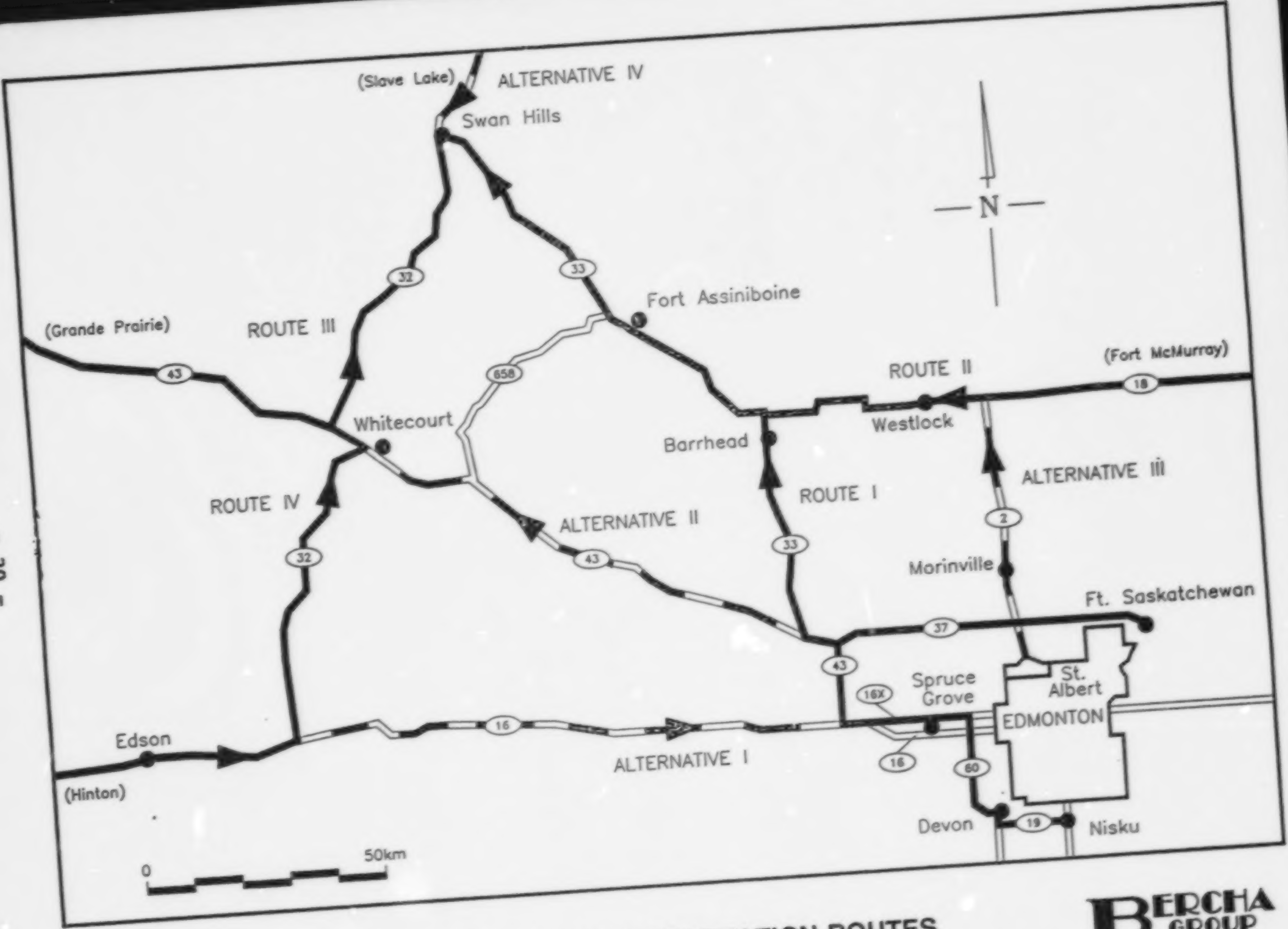
The principal contributing factor to the incremental increase in estimated accident and spill frequencies for the expansion facilities compared to the existing facilities is the obvious increase in transportation volume. The total number of shipments is estimated to increase about eight-fold and the distribution of this increase according to category of special waste is presented in this vu-graph. As may be seen, for the four different categories of special waste, the number of shipments associated with the expansion is much greater than that existing today. In addition, the distribution among categories has changed. In particular, sludge is non-existent today and will be a significant portion of the expansion volumes.

Vu-Graph 8: Percent Distribution of Future Special Wastes by Dangerous Goods Classification

As in a similar graph previously shown for the dangerous goods classification of present special wastes, this vu-graph is associated with the future volumes. For the expansion facilities the percentage of non-class 9 or more dangerous special wastes will be similar to that associated with present conditions. The distribution of wastes includes sludge and greater proportions of bulk solids and liquids compared to the distribution today.

Vu-Graph 9: Expected Accident and Spill Frequencies

The expected accident and spill frequencies were analyzed for both the existing special waste traffic today and the expected maximum traffic associated with the expansion facilities. Frequencies were also estimated in a previous analysis undertaken prior to the design and construction of the present Swan Hills facilities. The three sets of results for pre-Swan Hills today and expansion scenarios are shown in this vu-graph. As may be seen, not all accidents result in a spill although both the accident and spill rates may be expected to increase due to expansion. These rates would be much less than those originally estimated before the present facilities were constructed. The reason for this reduction is due to the use of specialty trucks to handle larger volumes of special waste in fewer shipments and a better safety record.


(Slave Lake)
ALTERNATIVE IV
Swan Hills
N
32
33
Fort Assiniboine
(Grande Prairie)
ROUTE III
ROUTE II
(Fort McMurray)
18
43
658
Whitecourt
Westlock
Barrhead
ALTERNATIVE III
ROUTE IV
ROUTE I
ALTERNATIVE II
2
33
32
43
Morinville
Ft. Saskatchewan
37
43
St. Albert
Spruce Grove
16X
EDMONTON
Edson
16
ALTERNATIVE I
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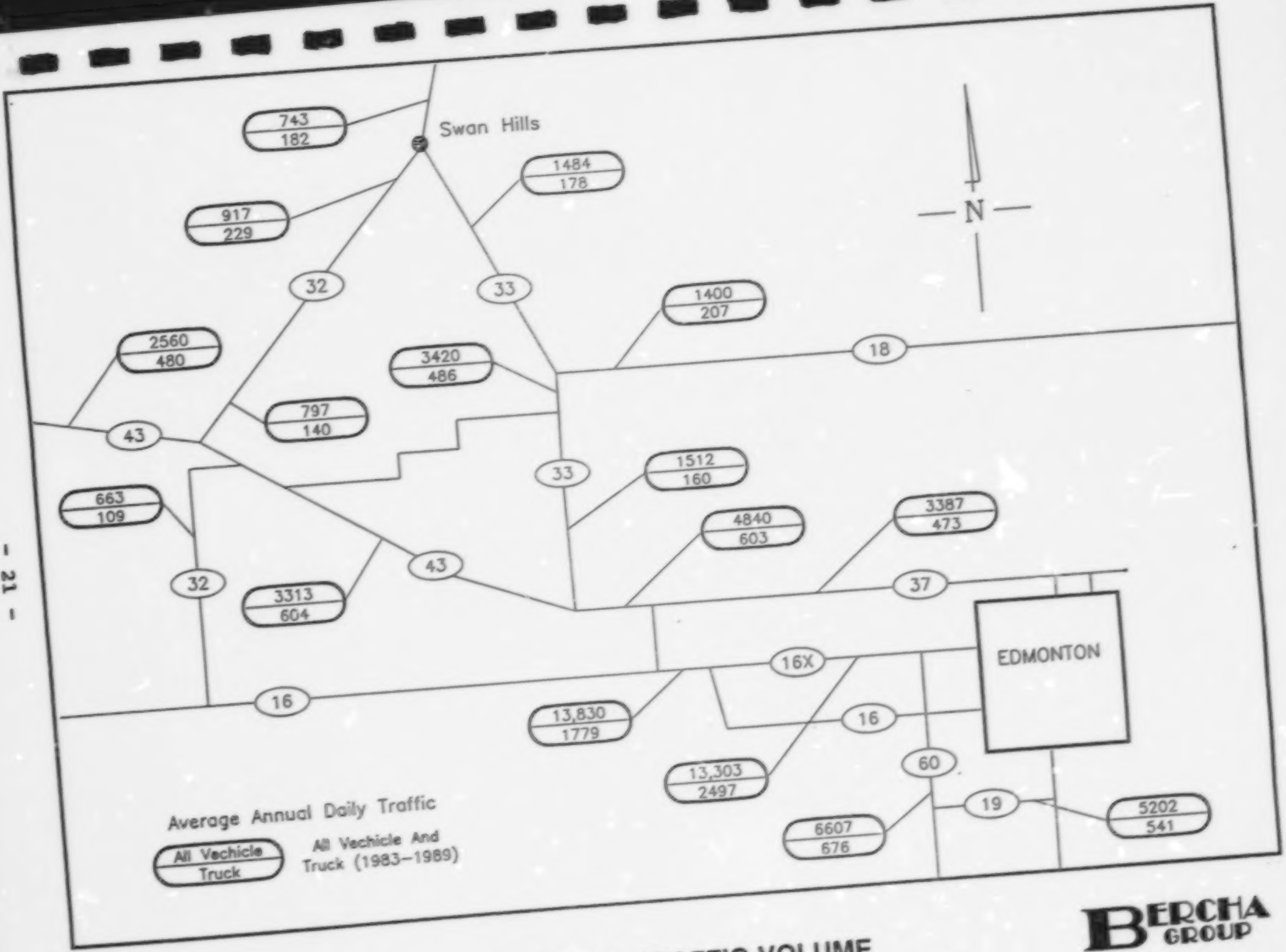
SPECIAL WASTES TRANSPORTATION ROUTES

BERCHA GROUP


743
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Swan Hills
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486
797
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43
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663
109
4840
603
3387
473
43
32
3313
604
37
EDMONTON
16X
16
16
13,830
1779
60
13,303
2497
19
5202
541
6607
676
Average Annual Daily Traffic
All Vechicle
Truck
All Vechicle And Truck (1983–1989)

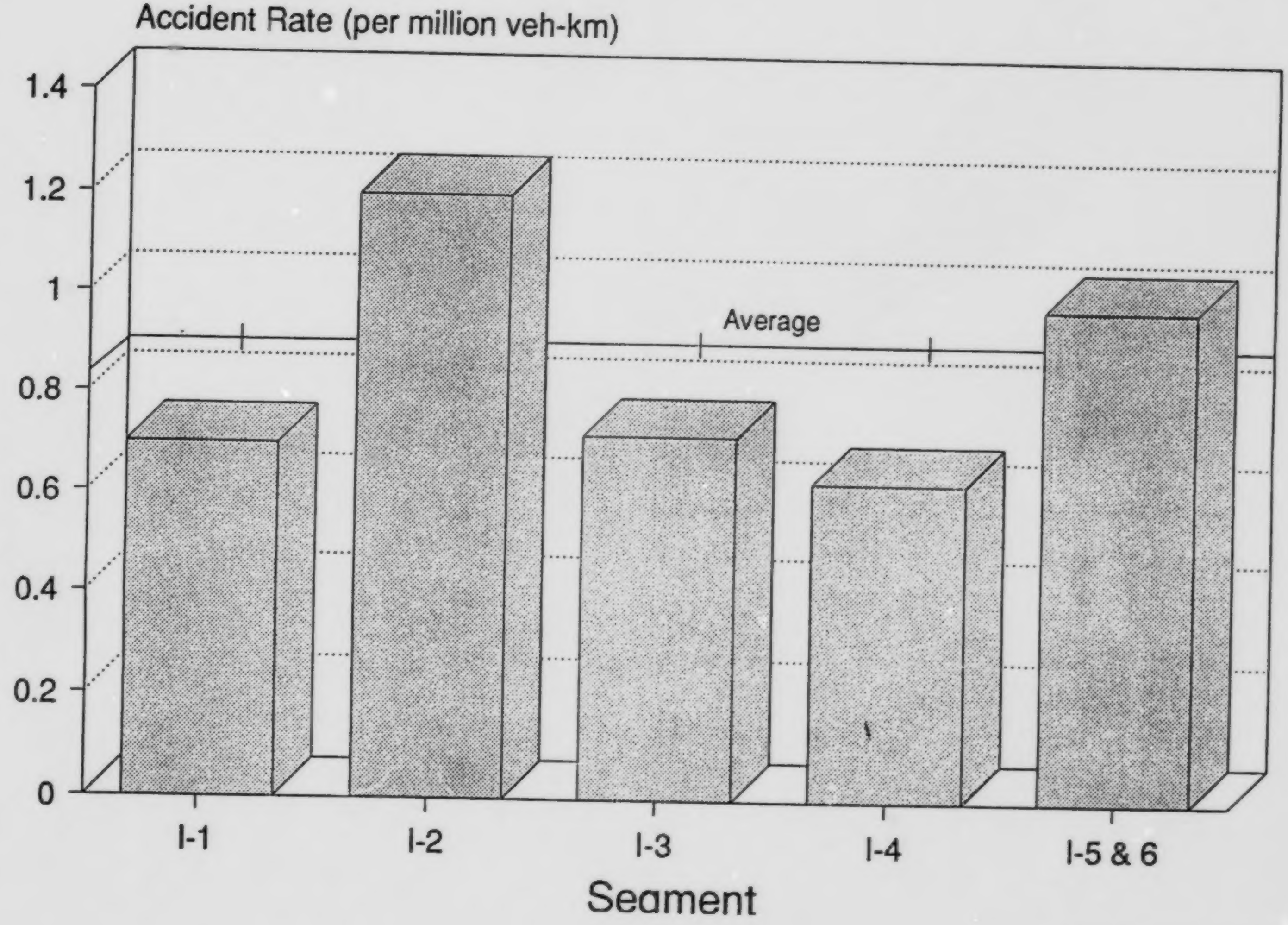
BERCHA GROUP

REGIONAL TRAFFIC VOLUME

1989 DISTRIBUTION OF SPECIAL WASTE TRAFFIC

SPECIAL WASTE TRAFFIC	ROUTE			TOTAL
	I	II	III	
CATEGORY OF SHIPMENTS:				
A) DRUM	223	15	12	250
B) BULK SOLID	8	3	1	12
C) BULK LIQUID	39	13	4	56
TOTAL SHIPMENTS	270	31	17	318
% DISTRIBUTION	85	10	5	100

Segment Accident Rates for Route I



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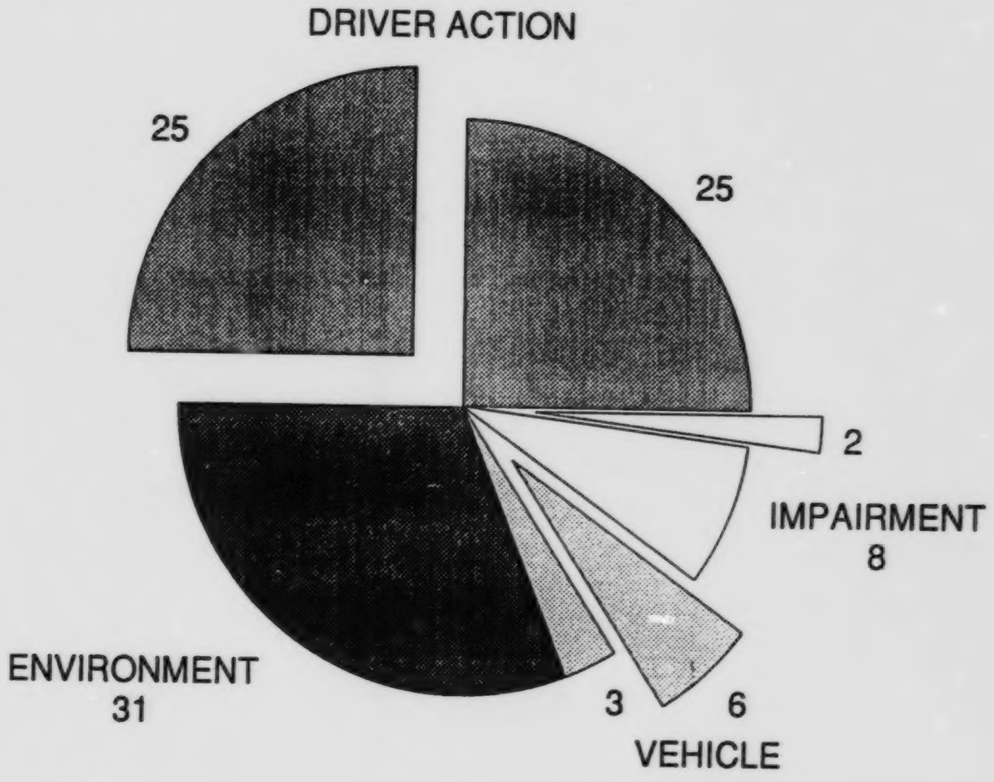
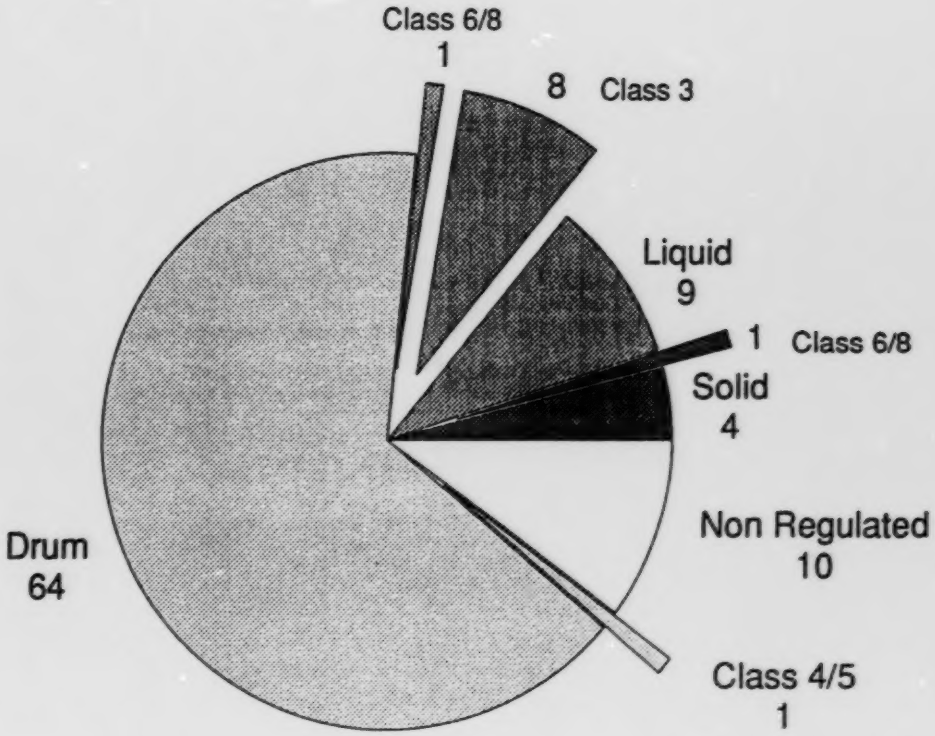
CONTRIBUTING FACTORS IN ACCIDENTS INVOLVING HAZMAT TRUCKS

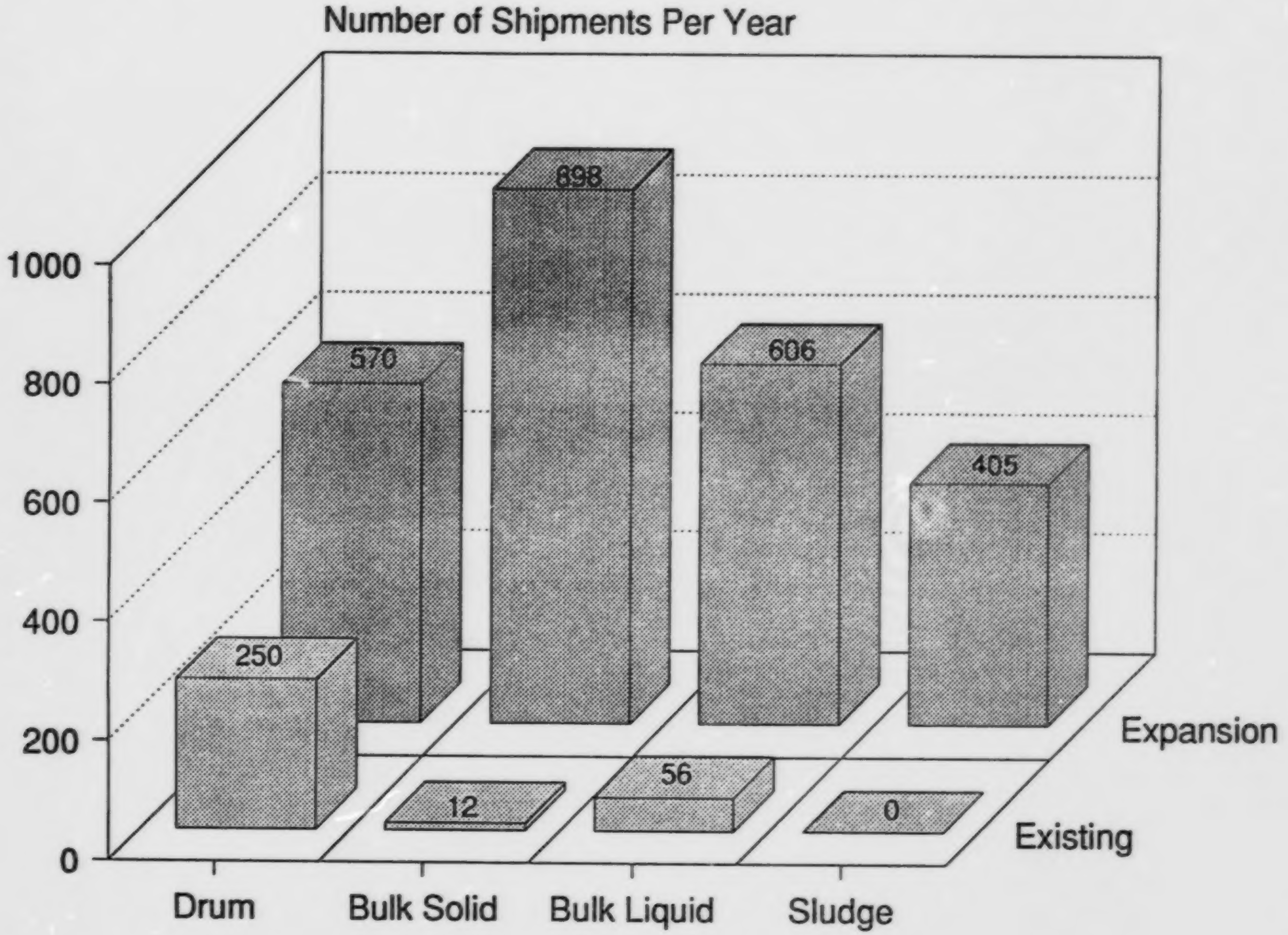


% Distribution of Today's Special Wastes by Dangerous Goods Classification*



* Non cutout portion of graph represents Class 9

Special Waste Traffic Comparison Between Existing and Expanded Facilities



Number of Shipments Per Year

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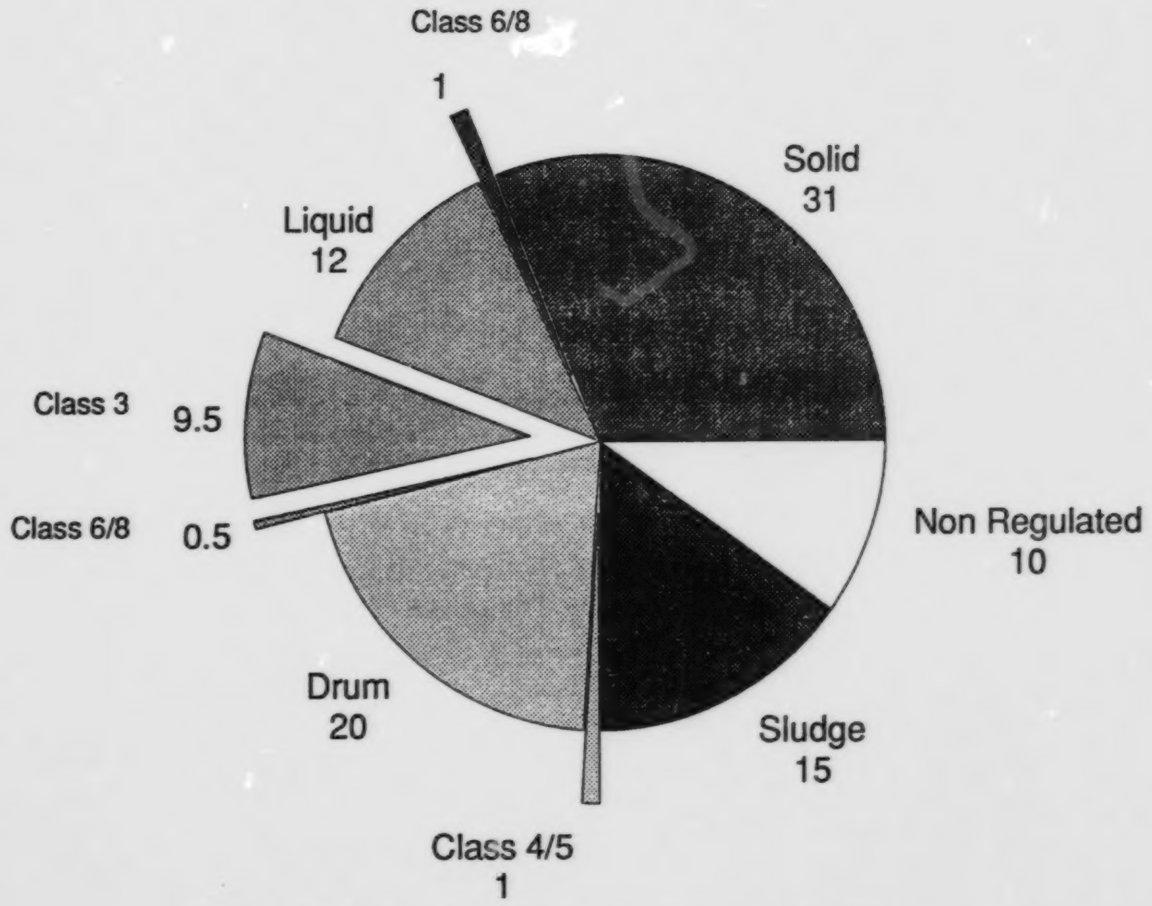
% Distribution of Future Special Wastes By Dangerous Goods Classification*



* Non cutout portion of graph represents Class 9

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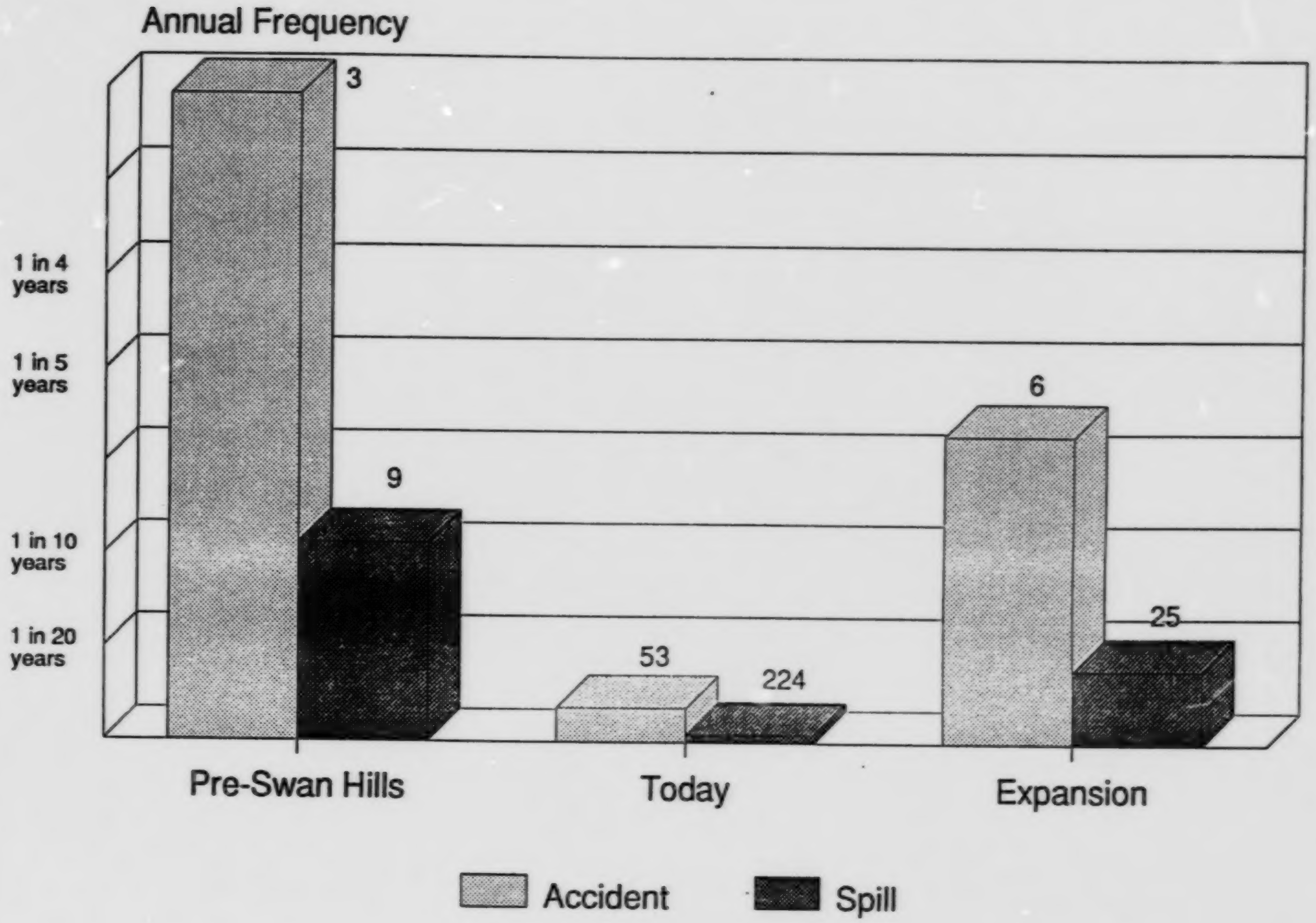
Expected Accident And Spill Frequencies



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AIR QUALITY

EIA Consultant: Dr. Douglas Leahey
Western Research

Background to the Air Quality study includes:

1. The Alberta Special Waste Treatment Centre (ASWTC) is not located in a pristine area. Within a radius of about 50 km there are some 85 oil batteries, 25 compressor stations, 9 gas processing plants four of which process sour gas, a land fill site and the town of Swan Hills. All but five of these sources lie to the west of the ASWTC.

2. Winds at the ASWTC blow from the west about 80 percent of the time. This means that containment releases are blown away from built up areas for a large majority of the time.

3. Observations of air quality and meteorology have been conducted from Dec. 4, 1985 up to the present time. (Operations at the plant commenced on Aug. 25 1987).

4. The air quality monitoring trailer is located to the southeast of the plant sites. There are also five sites at which there are static monitors for measuring fluorides. Three of these static monitors are at the plant site, one is in the town of Swan Hills and the remaining two are on the road from Swan Hills to the plant site.

5. Monitoring has been done for the ten atmospheric contaminants shown in Table 13. Instrumentation used for measuring these as well as meteorological variables is as shown in Table 1. (Tables 13 and 1 are given on the following two pages.)

6. Measured contaminant values presented in Table 13 show that they were almost always very small. Exceptions occurred with respect to total suspended particulates (TSP) which exceeded the desirable value of 100 ug m^{-3} during the pre-operation period and again in 1989. These exceedances were due to dust generated by construction and vehicular activities.

   The guidelines for fluorides of 40 ug/100 cm^{-2}/30 d^{-1} was exceeded in 1989 for unknown reasons. Information for 1990 up to the end of September show that fluoride concentrations are once again within the guidelines.

TABLE 13

Maximum concentrations for contaminants measured at the ASWTC during the indicated observational period

	Period			
Contaminant	Pre-Operation (4 December 1985 - 10 July 1987)	1987 Operation (25 August 1987 - 31 December 1987)	1988	1989
SO_2 (ppm)*	0.066	0.021	0.024	0.041
H_2S (ppm)*	0.007	0.003	0.007	++
NO_x (ppm)*	0.130	0.074	0.080	0.103
NO (ppm)*	0.122	0.063	0.072	0.092
NO_2 (ppm*	0.035	0.027	0.034	0.027
CO (ppm)*	5.9	0.90	1.3	3.3
THC (ppm)*	19.0	5.0	3.2	6.2
O_3 (ppm)*	0.074	0.061	0.087	0.105
TSP (mg m^{-3})**	453	51	70	114
F (μg 100 cm^{-2} $30d^{-1}$)+	12	8	62	160

*	hourly average
**	24-hour average
+	monthly average
++	not measured

TABLE 1

Maximum concentrations for contaminants measured at the ASWTC during the indicated observational period.

	Period	
Contaminant	1989	1990 (1 January - 30 September)
SO_2 (ppm)*	0.041	0.049
NO_x (ppm)*	0.103	0.128
NO (ppm)*	0.092	0.116
NO_2 (ppm)*	0.027	0.028
CO (ppm)*	3.3	3.6
THC (ppm)*	6.2	13.1
TSP (mg M^{-3})**	114	118
F (μg 100 cm^{-2} 30 d^{-1})	160	11

* hourly average

** 24 hour average

7. Ozone concentrations in the plant vicinity have been shown to decrease as the result of plant stack emissions of nitric oxide. This is because of the scavenging effects of this compound.

8. Monitoring for ozone and hydrogen sulphide has been discontinued at the ASWTC because it is now recognized that the Centre is not a source of these compounds.

9. Observed sulphur dioxide concentrations were most often associated with southwesterly winds which are from the direction of two gas plants which flare sour gas.

10. Detailed meteorological data from the ASWTC has been used together with sophisticated plume dispersion models developed by the U.S. Environmental Protection Agency to predict ground level contaminant concentration which will result from ASWTC emissions.

11. Dispersion model calculations show that 24 hour average ground level concentrations of PCBs resulting from kiln and cooling tower emissions are very much less than the environmental standard of 150 ng m^{-3}.

12. Dispersion model calculation results also show that ground level PCB concentrations resulting from present fugitive emissions will exceed the environmental standard in a very localized area near the plant boundary. Concentrations, however, are very much less than the standard designed to protect the workers' health. This standard is 500,000 ng m^{-3}.

13. Steps are being taken to change plant operations in such a manner as to greatly reduce fugitive emissions of PCBs.

14. Dispersion models will also be used to evaluate air quality implications of other contaminant emissions besides PCBs. Attached figures show, for example, predicted hourly, daily and annual average ground level sulphur dioxide concentrations in the region of the ASWTC. All concentrations are shown as being well below maximum permissible values for hourly, daily and annual averages of 170, 60 and 10 parts per billion (ppb) respectively.

15. Model results similar to those shown for sulphur dioxide will be used to ensure that ground level concentrations of a wide range of contaminants emitted from the ASWTC are also within permissible limits. These contaminants will include 6 standard pollutants, 14 products of incomplete combustion, 40 principle organic hazardous constituents and 21 trace metals.

VEGETATION, SOIL AND LAND

EIA Consultant: Dave Reid
Hardy BBT Limited

My job has been to monitor the soil and vegetation and is now to assess the potential impacts of the proposed plant expansion near Swan Hills on the surrounding soil and forest vegetation.

In September I985, the Alberta Special Waste Management Corporation commissioned Hardy BBT to collect baseline data on the soil and vegetation in the vicinity of the proposed Treatment Centre. Our first step was to document the background characteristics (normal range of variation) of the soil and vegetation. Next we used these characteristics to monitor whether or not any changes occurred since operations began in I988. We are looking at air emissions as potentially the major cause of environmental change. The combination of baseline and monitoring data provides us with a unique opportunity to assess the impacts of the proposed expansion.
So what did we measure?

The soil and vegetation characteristics included in the study are:

1. soil chemistry;
2. vegetation health and composition;
3. vegetation foliage chemistry;
4. lichen health and growth;
5. moss tissue chemistry.

Baseline

We started baseline data collection in September I985 and continued over three sampling periods until September I987. The study was designed to sample the most common soil and vegetation types in twelve permanently marked plots located both up and downwind to the Centre. In view of the need to conduct long-term monitoring in a consistent and careful fashion, we documented all of the sampling and analysis procedures in a protocol manual.

Soil chemistry is a traditional and relatively simple method of monitoring air pollution. We obtained soil samples from several depths up to 1 m below the surface at each plot. The chemical analysis consisted of 38 separate elements and compounds which included:

1. common parameters such as acidity, salinity, nitrogen, phosphorous;
2. trace inorganic elements - chromium, lead, zinc; and
3. trace organic compounds - pesticides and PCBs.

The use of vascular plants to monitor potential air pollution is primarily an indirect and long-term technique. First we identified vegetation health and evidence of insects and diseases. Flooding and other causes of damage not related to the operation of the plant were noted.

We collected the needles of black spruce and lodgepole pine trees, and leaves of Labrador tea from each plot. The chemical analysis consisted of several tests, including:

1. nutrients - nitrogen, calcium;
2. trace inorganic elements - chromium, lead;
3. trace organic compounds such as cyanide and PCBs.

Lichens are considered to be more sensitive than vascular plants to air pollutants. As a result they have been used as an early warning system, particularly for acid gases such as sulphur dioxide. We identified trunk dwelling lichens at 50 sites surrounding the facility. Using a 35mm camera I photographed these lichens then measured the growth of each.

Mosses, because of their much branched form, are very efficient collectors of airborne particles including heavy metals. The use of replaceable moss-filled bags for assessment of potential air pollutants is advantageous because of their uniform receptor surface, controlled exposure period and non-destructive sampling. We placed moss bags at the same 50 locations as the lichen sites surrounding the Centre. These bags were collected regularly and tested for 11 trace elements.

Monitoring

We began monitoring the operation of the Centre in September l988 and have continued for three sampling periods. We used the same measurements during the monitoring program. To illustrate the results, the following summary of chromium is used. Chromium, as you know , is the shiny metal used to coat car bumpers.

Both soil and Labrador tea leaves show slight but insignificant changes during operations. The results of monitoring other elements and compounds was also similar.

We did not detect any changes in the growth rate of lichens or the chemistry of mosses.

The only change during operation was that we detected small amounts of PCBs that were a result of the fugitive emissions described earlier. The PCBs were first detected in September l989 in the soil and vegetation. We sampled the area again in February l990 and found trace amounts of PCBs to be located mainly east and southeast of the plant. An area of approximately 140 ha (345 ac) is involved.

The amount of PCBs is small and is not harmful to the vegetation. The monitoring program will continue.

Impact Assessment of the Expansion

The proposed expansion of the Centre may potentially impact soil and vegetation primarily through changes in air quality. The assessment will therefore be based on the new air quality predictions, and the results of our program which monitored the plant operation over the past three years.

Summary

In summary, we have documented the soil and vegetation characteristics in the vicinity of the plant for three sampling periods prior to operation. This established the normal range of variation of various chemical and growth parameters.

We have monitored the operation of the Centre since 1988. For the most part, only slight but insignificant changes have occurred in the soil and vegetation characteristics except for PCBs as noted.

Unlike most development projects, this long-term baseline and monitoring program provides site specific data on which to assess potential impacts. This data gives us a wealth of information and enables us to design and select the best approach to minimizing impacts.

WILDLIFE

EIA Consultant: David Penner
Penner & Associates Ltd.

Introduction

This overview addresses four topics:

- The Background and Protocols of the Wildlife Monitoring Program;
- The Results of Wildlife Monitoring during Baseline and Operations Phases up to 1990;
- The Scope of the Wildlife Impact Assessment; and
- Potential Impacts to Wildlife from the Proposed Expansion.

Terms of Reference

The objectives for Wildlife Monitoring have remained constant from the initiation of investigations in 1986 to the present. These objectives are:

1. To maintain a systematic field study and sampling program on representative species of wildlife;
2. To monitor the demographic characteristics of small mammals;
3. To monitor the concentrations of chemicals in small mammal tissues; and
4. To assess any changes in population characteristics and tissue chemical concentrations that may be linked to the Operations Phase of the Centre.

Representative Wildlife Species

A diversity of bird and mammal species live in the boreal forest habitats near the Treatment Centre. From these species, we selected small mammals and specifically Gapper's red-backed vole as the most suitable animals to represent wildlife in our monitoring program. The reasons for this choice include the following attributes: small mammals are permanent residents and maintain small home ranges; they are relatively abundant and have a high reproductive rate; small mammals are readily studied by humane live-trapping techniques; and these animals represent the first order consumers in the food chain.

What is a red-backed vole? This animal can be visualized as a shy, red-furred, short-tailed, forest dwelling mouse. An adult vole weighs about 20 grams. This species is the most consistently abundant animal in the coniferous forest habitats near the Centre and is the focus of our monitoring studies.

Where is the Wildlife Monitoring Conducted

Twenty stations are currently monitored during June and September each year. The monitoring program has evolved since the first eight monitoring stations were established in 1986 to meet changing needs and new information on predicted chemical dispersion zones.

The monitoring stations are located at distances ranging from 50 m beyond the perimeter fence to 1,700 m from the Centre and cover several directions within the predicted impact zones. A minimum of three replicate monitoring stations are located in each of the high, moderate and low impact zones and for the spacial controls. These replicates document natural variance in studied parameters and facilitate statistical assessment of any trends.

The monitoring stations also represent the three dominant ecosites in the area and are located near the soils and vegetation monitoring stations. Monitoring of soil, vegetation and wildlife at the same sites facilitates the assessment of potential cycling or accumulation of hazardous chemicals in the food chain.

How is the Wildlife Monitoring Conducted and What Have We Found During Baseline and Operation Phases?

Firstly, all methods and sample records of the wildlife monitoring program are detailed in a Protocols Document to ensure consistency in procedures and to provide a complete record of investigations.

The wildlife monitoring program focuses on two main parameters: populations and tissue chemistry.

1. Monitoring of small mammal populations is conducted by a standard live-trap, mark - release and recapture technique during June and September each year. The demographic data include: species composition, seasonal abundance, reproductive status, recruitment and survival of small mammals.

   The overhead shows the number of voles captured in each impact zone and spatial controls during Baseline Conditions and during the three years the Centre has been in operation. In all zones, the vole populations have exhibited normal and similar annual fluctuations in abundance. There have been no significant changes in red-backed vole demographic parameters that can be linked to the hazardous waste treatment at the Centre.

2. The first overhead on Tissue Chemistry shows the similarity in the macro-nutrient and micro-nutrient chemical concentrations in whole body vole tissues between baseline conditions and the operations phase. These data are presented here only to demonstrate the main trends and can be reviewed in more detail during the workshop.

   The next overhead compares the levels of trace inorganic and trace organic chemicals which include the more toxic chemicals to wildlife. Of the array of 30 chemicals monitored in vole tissues, only PCBs have shown significant changes since Baseline Monitoring. Minor variations in concentrations from baseline levels have occurred in several other chemicals, as indicated by the "C" notation. None of these changes, however, are significant in relation to impact zones or potential bioaccumulation that can be linked with the operations of the Centre.

> As an example, arsenic was non-detectable during Baseline Monitoring or in the spatial controls. Arsenic began occurring at just above detection levels in several monitoring stations near the Centre in 1988. The pattern of arsenic occurrence has not been consistent in relation to impact zones and no linkage with the Centre is apparent. The occurrence and levels of arsenic and the other irregular chemicals will continue to be evaluated through further monitoring of vegetation and wildlife and in relation to air quality modelling.

The detection of PCBs in voles and vegetation tissues in 1989 has demonstrated the effectiveness of the Environmental Monitoring Program as an early warning system for detecting hazardous chemical emissions. The PCB occurrence was brought to the attention of the Corporation and corrective actions were taken at the Centre to identify and control the emission source.

The health of red-backed vole populations does not appear to be adversely affected by the observed body burdens of PCBs. The tracking of PCBs over one full year has also shown the variability in accumulation by different individuals and age classes, and by season and location. The general trends observed include an increase in PCB concentrations in vole tissues and in the area affected from June 1989 to June 1990 and higher levels in winter than summer periods. These trends are demonstrated in the following description of the stages of investigation and results of PCB monitoring.

Low levels of PCBs were first detected in red-backed voles from five sites in June 1989. The highest PCB levels were 0.16 parts per million (ppm) in whole body tissues and 1.1 ppm in fat tissue. During regular monitoring in September 1989, PCBs were not detected.

Confirmation analysis on archive tissues also measured low levels of PCBs in June samples of three species: red-backed vole, deer mouse and dusky shrew. One vole and two shrew samples from September were analyzed and only the dusky shrew samples showed measurable levels of PCBs.

Additional sampling of voles in February, 1990 was designed to assist in establishing source linkage and to determine the extent of PCB dispersion. Samples from these 10 monitoring stations contained measurable levels of PCBs, the highest of which were adjacent to the Transformer Processing Area and along the eastern perimeter of the Centre. PCB concentrations ranged from 0.2 to 9 ppm in whole body tissues and up to 160 ppm in fat tissues.

During regular monitoring in June 1990, supplementary sampling was conducted to determine the extent of PCB dispersion from the Centre. The results confirmed the presence of PCBs in vole tissues at all sites examined and covering approximately 60 km^2. The higher concentrations were near the Centre and the furthest sites showed trace amounts, indicating that the sampling distribution was near the extent of the PCB dispersion for July 1990. PCB levels ranged from traces to about 6 ppm in fat tissue, and were lower than measured during February.

Future monitoring for PCBs will assess the effectiveness of the corrective measures at the Centre and the environmental fate and dissipation of the fugitive emissions in the local environment.

Scope of EIA Investigations

The wildlife impact assessment covers five main tasks.

1. The first task is the documentation of the existing conditions, which include a baseline inventory of wildlife populations and habitat in the area.
2. The second task involves a review of results from the environmental monitoring programs, the current and predicted chemical emissions and air quality modelling.
3. The third task documents the residual impacts from the current operations.
4. The next task involves a review of mitigation measures for the current operations and makes recommendations of mitigation measures for the proposed expansion.
5. The final assessment addresses residual impacts from the proposed expansion of the Waste Treatment Centre on wildlife populations.

Potential Impacts of the Proposed Expansion

The proposed expansion may impact wildlife in three main ways. These impacts include habitat loss and habitat alteration, disturbance to wildlife and potential impacts from chemical emissions. It logically follows that mitigation measures be incorporated into the design of construction and operations phases to avoid or minimize these impacts.

For the physical expansion of the Centre, we are focusing on minimizing the amount of habitat loss and habitat alteration and the reclamation of all disturbed habitats when the use of sites is complete and upon site closure.

The main efforts in the wildlife impact assessment are directed to identifying any potential chemical emissions which could impact the health of wildlife populations near the Centre. This assessment includes:

1. Evaluation of the predicted stack emissions in relation to air quality criteria. These chemicals were previously described by Dr. Douglas Leahey.

2. Evaluation of potential fugitive vapour and dust emissions in relation to air quality criteria; and

3. Evaluation of the potential toxicity and bioaccumulation of any significant chemical emissions to wildlife.

Future monitoring will give special attention to potential emissions of hazardous chemicals that are known to bioaccumulate in birds and mammals. This contribution to the Environmental Monitoring Program will assist in providing an effective early warning system which, together with the proactive response plan, will avoid or minimize adverse effects of the waste treatment centre on wildlife populations.

This concludes my presentation on the wildlife monitoring program. I look forward to discussions and your comments on the wildlife Terms of Reference for the EIA during the afternoon Workshop.

GROUNDWATER AND SURFACE WATER ENVIRONMENTS

EIA Consultant: John Olson
Stanley Associates Engineering Ltd.

Stanley Associates Engineering Ltd. and Beak Associates Consulting Ltd. are responsible for monitoring the groundwater and surface water environments, at and adjacent to the Alberta Special Waste Treatment Centre, to identify any changes that might be considered an impact of facility operation. These changes are determined by comparison of recent or annual data with both the baseline and the overall data.

Like most of the other consultants we have been conducting this work since 1985. Between the spring of 1985 and the fall of 1987, we gathered baseline data - data that described the conditions that existed prior to the start of the operational life of the Treatment Centre. From the fall of 1987 to the present day, we have conducted active monitoring. We are currently engaged in completing the 1990 annual monitoring and assisting the Treatment Centre operators in evaluating the potential impacts of the proposed expansion on the groundwater and surface water.

Groundwater Monitoring

The primary mechanism of assessing impacts on the groundwater system is the evaluation of groundwater quality. The measurement of physical parameters such as water levels, while still important, is used to supplement the evaluation of any changes observed in groundwater quality.

We currently monitor 34 monitors and 25 piezometers at 13 locations around the Treatment Centre. Ten of these sites are adjacent to the main process area while three sites are in the new landfill area. Three distinct horizons are monitored: 0 - 5 metres and 5 - 10 metres in the till and a sandstone unit at a depth of 50 to 60 metres below ground level. The sandstone is the first usable aquifer beneath the Treatment Centre and is used by the facility as a water supply source.

We measure 43 separate parameters in three broad categories: general indicators, routine potability and trace elements. The concentrations of organic parameters are determined once a year.

Surface Water Monitoring

In assessing the surface weather system, the primary mechanism is once again the evaluation of changes in water quality. The measurement of physical parameters such as flow rates, water depths and cross-section widths is used to interpret any changes observed.

The Treatment Centre is presently within the headwaters of four tributaries to the Coutts River. Windy Lake, approximately 1.6 km northwest of the Treatment Centre, does not receive direct run-off from the vicinity of the Treatment Centre but is within the area of anticipated incinerator emissions fallout.

The area is part of the Swan Hills Uplands, a region typified by the rugged hilly topography characteristic of a maturely dissected plateau. The highest elevation within the four basins is 1200 m ASL while the elevation of the flat wetlands downstream of the Treatment Centre is approximately 1000 m ASL. The elevation at the Treatment Centre is approximately 1086 m ASL. The streams are well defined through the upper plateau region but in the wetlands the channels become ill defined.

We monitor nine surface water sites adjacent to the Treatment Centre: two sites upgradient (S2 and S6), and three sites downgradient (S3, S5 and S9). Site S4 serves as a control - it does not receive runoff from the Treatment Centre area. One site (S1) is located at the outlet structure that controls the level of Windy Lake. Two sites (S10, S11) are located at the collector ditches associated with the new landfill area.

Forty seven (47) surface water quality parameters in the same three categories as groundwater - (routine potability, broad spectrum and trace elements) are monitored. Organic parameter contents are analyzed once per year.

We also monitor some of the biota or life forms present within the surface water. Benthic invertebrates, or those life forms present at the water-substrate interface, are monitored in the stream sites while the fish in Windy Lake are also monitored. Each of the stream sites is assessed for the kinds and types of life present. Fish tissue samples are analyzed for trace element and organics parameter contents. Sediment samples collected from the stream sites are also analyzed for trace element and organic parameter concentrations.

Current and Future Impacts

The types of impacts that are currently seen at the Treatment Centre should be similar to those that would be observed under the proposed expansion. The main source of impacts on the groundwater and surface water environments, under the proposed expansion, is expected to result from spills, leaks or failures of stormwater or landfill cell liners. The effect of the deposition of airborne materials should be relatively small.

Most of the changes that have been observed in groundwater quality are thought to be products of the construction, not the operation, of the Treatment Centre. For example an approximate 0.3 m decline in water levels in the shallow monitor at site six may have resulted in a minor decline in the quality of groundwater from this monitor. Calcium concentration for example has increased from a mean of 75.2 mg/L during the baseline to 88.8 mg/L in 1989.

The increase in sulphate concentration in the shallow monitor at site 2 (monitor 2-4s) from approximately 4 mg/L during the baseline to 8 gm/L in 1989 may have resulted from site clearing during the construction of the landfill area.

Water levels in the sandstone aquifer used by the Treatment Centre as a water supply source have declined by one to two meters.

The changes observed in surface water quality are not as readily definable. The concentrations of sulphate at site S1 has decreased from 1.3 mg/L in the baseline to 0.4 mg/L in 1989. This is not considered to be an impact of Treatmant Centre operation.

Nitrate concentration has increased at three of the stream sites. The increase from a mean concentration of 0.01 mg/L during the baseline to 0.16 mg/L in 1989 at site S3 is typical. The cause of this increase is unknown but it may be an impact of Treatment Centre operation.

The dissolved oxygen content at two of the sites has decreased by three to four mg/L. At site S5, for example, the decrease was from a mean value of 10.3 mg/L in the baseline to 6.1 mg/L in 1989.

Mercury contents in some of the fish tissue have risen. The cause of rise between the 1988 and 1989 samples is unknown. The Treatment Centre has not destroyed any mercury contaminated wastes.

Anomalous, low level concentrations of 4 - Nitrophenol and pentachlorophenol were identified in the muscle tissue of 1+ age fish in 1986. This was before the facility was operational. These two parameters have not been identified since 1986.

Except for changes produced by beaver activity, and their damming of several streams, no differences have been observed in the benthic invertebrate community.

PCBs have not been identified in either the groundwater or surface water environments.

Closure

Changes are apparent in the surface and groundwater environments and have been detected by the monitoring program. The fact that these changes have been noted is considered to demonstrate that the monitoring program is working.

SOCIO-ECONOMIC

EIA Consultant: **Lan AuYeung**
Socio-Economic Consultant

Introduction

The socio-economic study in the EIA will focus on the effects of the proposed project on the communities and the people in the host region.

Unlike the other disciplines, there has been no systematic, comprehensive monitoring work carried out on the socio-economic discipline. Therefore, there is no monitoring data pertaining to the existing project on the socio-economic indicators. Some information is available pertaining to the operations of the existing facility, which can be used as a basis for estimating changes that could be attributable to the existing project, and for changes that may occur as a result of the proposed expansion. For example, information is available on direct employment and expenditures of the current operations, but little information is available on the construction activities associated with the existing facility. Indirect or secondary effects will be estimated only wherever adequate information exists, particularly for changes that may result from the existing facility.

In general, the socio-economic impact study will follow a similar format to the other disciplines:

1. baseline conditions;
2. changes due to the existing facility;
3. impact of proposed project;
4. mitigation measures.

However, due to the lack of a monitoring data base, the bench mark or baseline for the socio-economic discipline will pertain to the existing conditions, and not to the pre-project conditions.

The focus of the socio-economic discipline will be on the impact assessment of the proposed expansion project.

My presentation today will focus on the study process, as much of the information collected for the socio-economic assessment is still being expanded, processed and analyzed.

Study Region

We will focus on the Town of Swan Hills. Due to the town's proximity to the facility, we anticipate the economic and social impacts to be largely felt by the Town of Swan Hills. The surrounding region and the adjacent communities will also experience some impacts, although we anticipate them to be of a lesser degree. So, for the socio-economic discipline, we've defined the study area to be principally the Town of Swan Hills, with consideration for potential impacts in the surrounding area which includes Improvement District 17, ID 15, County of Barrhead, Town of Whitecourt, Town of Westlock, Town of Slave Lake and Town of High Prairie.

Socio-Economic Indicators

There are three broad socio-economic indicators which will be studied. Under each broad indicator, the study will start with a series of questions. Information will then be collected to address these questions and analyses carried out. There are a number of information sources:

1. published reports and data;
2. interviews with community representatives;
3. and Chem-Security - the operator and project proponent

The sub-indicators under each of the broad indicators are described as follows:

1. Economic Conditions

    - principal basic sectors, historic employment, labour force, unemployment, historic changes, probable outlook without the project, direct employment and income benefits, spin-off or multiplier effects, tax benefits.

2. Population

    - historic changes, how changes in economic activities affected population, in-migration during construction and operations, demographic characteristics.

3. Social Conditions

    - focus on Swan Hills.

    - current capacity and ability to accommodate changes of housing, community services (including education, health care, social services, community recreation, police services) and community infrastructure such as water and sewage facilities, future demand due to project, need for expansion, assessment of impact emphasizes significant impacts.
    - community well-being (as reflected in community attitudes).

Guidelines of Study Approach

The study process is guided by the following principles:

- must be responsive to local issues and concerns;
- will emphasize significant impacts;
- will separate construction phase impacts from operation phase impacts as they call for different planning actions;
- interaction with the public consultation process as the key;
- place importance on mitigation and enhancement measures.

Note: too early to determine what mitigation measures will be required; however, the following areas will likely be where mitigation will be developed:

- housing (construction and operation);
- some community services and infrastructure;
- local employment and business opportunities.

Some Preliminary Project Information Relevant to the Socio-Economic Discipline

1. Construction Time Frame
   - 1991 - 1993
   - equipment life - 25 years

2. Construction Personnel
   - Year 1: average 75 (peak 170)
   - Year 2: average 175 (peak 220)
   - Year 3: average 25 (peak 100)

3. Operations Personnel
   - existing: 94 persons
   - new facility: add 40 persons

4. Estimated Capital Cost
   - approximately $60 million

5. Estimated Operations Expenditures (annual)
   - current: approximately $14 million
   - new facility: $2.5 - $3 million

HEALTH RISK ASSESSMENT

EIA Consultant: **Dr. Bob Willes**
CanTox Inc.

CanTox has been contracted by Chem-Security (Alberta) Ltd. to conduct an environmental and human health risk assessment on the existing and proposed expansion to the Alberta Special Waste Treatment Centre facility near Swan Hills, Alberta. This assessment will have four major objectives:

1) To assess the potential adverse impacts on the environment and humans from stack and fugitive emissions based on the Alberta Special Waste Treatment Centre operations to date.

2) To assess the potential adverse impact of the proposed expansion of the Alberta Special Waste Treatment Centre facility from stack and fugitive emissions under normal operating conditions.

3) To assess the potential impacts of various upset conditions from the proposed expansion.

4) To assess the predicted impacts that would be associated with normal background exposures to chemicals that would occur if the Alberta Special Waste Treatment Centre facility did not exist.

Work on these four objectives has only recently started and I hope this stakeholder meeting will provide impacts on any additional issues or concerns that should be considered.

What I would like to do next is present a brief overview of how an environmental health risk assessment is conducted.

The basic premise of risk assessment in general is that the response of the body to a chemical depends on the dose or exposure level and if exposure is low enough, no response of the body will occur. Almost everyone is familiar with this concept through the consumption of drugs and alcohol. With alcohol, as consumption (i.e., the dose) increases to a given level a mild response of the body occurs. As the dose increases, the response increases to the point where adverse or unpleasant effects occur. With drugs your physician prescribes a dose sufficient to produce the desired pharmacological response from the drug in order to cure or alleviate the disease symptoms.

In the case of environmental hazard/exposure assessment we want the dose to be low enough so that no adverse responses are evident. To determine if the exposure (i.e., dose) of chemicals received from the Alberta Special Waste Treatment Centre operations will or will not produce adverse effects in the environment or human health, the assessment involves:

1) The characterization of the site, receptors (i.e., those exposed) and the chemicals.

2) The establishment of exposure limits for the chemicals. This step is called the hazard assessment.

3) The prediction of the levels of exposure (i.e., the dose) of the chemicals that will occur under existing operation, future normal operation, future upset operation and normal background conditions.

The site is the area around the Alberta Special Waste Treatment Centre facility, including the town of Swan Hills. The receptors chosen to date are: an inside worker on site, and outside worker on site, an adult and a child (4 to 6 years of age) living at the point of highest estimated emissions, residents of the town of Swan Hills and wildlife (i.e., voles) near the site.

The chemicals will be selected based on the predicted emissions from the incinerators.

The hazard assessment will evaluate the recommended exposure limits for the selected chemicals as established by regulatory agencies such as Health and Welfare Canada World Health Organization, U.S. EPA, etc. Their recommended exposure limits will be updated based on currently available toxicological information. If exposure limits for specific chemicals are not available, they will be developed by Cantox and reviewed by regulatory agencies.

The exposure estimates for the hypothetical receptors will be based on various receptor characteristics (i.e., amount of air, water and food consumed, dust/dirt exposure, etc.) and the predicted amounts of chemicals in their media.

The concentration of chemicals in the various exposure media will be based on monitoring data (for background and current operations) and the predicted air concentrations for future operations based on air dispersion modelling of the emissions from the incinerators.

The final risk assessment will be based on a comparison of the recommended exposure limits with predicted exposure of the various receptors for the different operating conditions. This ratio is called the Relative Margin of Safety (i.e. RMOS = exposure estimate divided by the exposure limit). If the RMOS value is less than one (1) the predicted exposure level would be less than the exposure limit and no unacceptable health risk may be predicted. If RMOS is greater than one, the predicted exposure level would be greater than predicted exposure level and unacceptable health risks may be predicted.

RMOS values will be calculated for each chemical for each receptor for each operation condition. In addition, the potential risks associated with simultaneous exposure to groups of chemicals will be estimated by adding the RMOS values for individual chemicals in the group.

The basic premise for judging the acceptability of the various operating scenarios is that the facility should not result in increased health risks over normal background exposures.

IV WORKSHOP REPORTS

An overview of the concerns raised during the workshop sessions prefaces this section of the report. It is followed by the individual facilitators' reports from each workshop.

The workshop reports are given in this order: Transportation; Air Quality; Vegetation, Soil, Land and Wildlife; Fish and Water; Socio-Economic; and Health Risk Assessment. The Health Risk Assessment workshop was divided in two due to its size. The two reports from these groups were amalgamated by the facilitators.

The reports itemize the concerns, issues and questions raised by each group. The EIA consultants endeavoured to answer, clarify and explain these issues during the workshop sessions. When completed, the Draft EIA will provide further clarification.

Workshop Information

Purpose:

> The purpose of each workshop was to have participants identify issues which they felt Chem-Security (Alberta) Ltd. and its consultants should consider in preparing the Draft Environmental Impact Assessment for the proposed expansion of the Alberta Special Waste Treatment Centre near Swan Hills.

Topic:

> Review of the Draft Terms of Reference for the proposed expansion of the Alberta Special Waste Treatment Centre.

Workshop Personnel

Transportation Workshop

Facilitator:	Gary Willson
EIA Consultant:	Brian Griffin - Bercha Group
Recording Secretary:	Janyne Sinclaire

Air Quality Workshop

Facilitator: Bob Paddon

EIA Consultant: Dr. Douglas Leahey - Western Research

Recording Secretary: Sandra Bishop

Vegetation, Soil, Land and Wildlife Workshop

Facilitator: Jacquie Champion

EIA Consultants: Dave Reid - Hardy BBT Ltd.
David Penner - Penner & Associates Ltd.

Recording Secretary: Judy Augustin

Fish and Water Workshop

Facilitator: Ursula Wohlfarth

EIA Consultants: John Olson - Stanley Associates Engineering Ltd.
Paul Shin - Beak Associates Consulting Ltd.

Recording Secretary: Colleen Smecko

Socio-Economic Workshop

Facilitator: Jack Sklofsky

EIA Consultant: Lan AuYeung - Socio-Economic Consultant

Recording Secretary: Lisa Kuspira

Health Risk Assessment Workshops

Facilitators: Elise Lavigne-Bruchet
Sharon Matthias

EIA Consultants:	Dr. Jim Cheng Dr. Bob Willes - CanTox Inc.
Recording Secretaries:	Maude Soppit Debbie Snook

OVERVIEW OF CONCERNS RAISED

The following summary itemizes the concerns common to all the workshops.

1. More basic, accessible information about the current plant operation should be provided, for example:

   a. An explanation of what waste the plant can and cannot handle and how it fits into the overall Alberta Special Waste Management process.
   b. An explanation of plant processes.
   c. An overview of mitigative measures i.e. transportation.
   d. Information on occupational health measures.

2. Data from the monitoring programs needs to be conveyed in a clear, concise and easily-comprehensible manner. It must also be interpreted and its significance explained.

3. A clearer explanation of the ongoing public consultation and information process must be conveyed.

4. The EIA process needs clarification regarding which guidelines are being followed.

5. A full evaluation of the need for the expansion of the Swan Hills facility should be given including:

   a. a detailed review of the sources of hazardous waste in the province;
   b. a reasoned study of the proportion of that waste that can be expected to be treated at Swan Hills (under different cost-scenarios);

c. a benefit-cost analysis of alternative methods of treating the waste, which could be put into operation at the site of the waste or elsewhere in the province. Such methods would include: solidification, pretreatment, biological treatment, use of a portable incinerator or construction of a new facility in the southern part of the province;
d. a benefit-risk analysis of alternative methods of treatment;
e. the effect of various amounts of expansion at Swan Hills, including the no-expansion option, on the reduction of hazardous waste in the province.

6. The place of the Alberta Special Waste Management System in the overall strategy for the management of hazardous waste in Alberta needs to be outlined. The 4R's are an integral part of this strategy. There is, however, a lack of awareness of these programs which needs to be addressed.

7. An action plan addressing native issues is needed.

8. What are the present and future stack emissions?

9. Clarify the roles of CS(A)L and the ASWMC.

TRANSPORTATION WORKSHOP REPORT

Concerns, Issues and Questions Raised

Facilitator's Note:

> Both the flip chart notes and notes of the compiled by the recording secretary were referred to in preparing the following list. They are the essence of this report. Some "writer's license" has been taken here, however, in attempting to present the issues identified as thoroughly as possible.

1. Who controls the private carriers? What is Chem-Security (Alberta) Ltd.'s responsibility in this and how do they exercise it?

2. What control measures does Chem-Security (Alberta) Ltd. have in place now to manage its own trucks?

3. What consideration is given to the monitoring of weather and its implications for the movement of trucks to Swan Hills? Who is responsible for this? (Note: The travel routes to Swan Hills are susceptible to rapidly changing weather conditions such as freezing rain.)

4. Thorough consideration has to be given to the width of the carriage ways along the routes. Both Highway 33 and Highway 43 beyond Gunn are quite narrow. As well, there are limited places for a truck to pull off safely on Highway 33. The road is quite narrow.

5. Are there equipment standards with which private carriers are going to have to comply? Are these standards the same as those for Chem-Security (Alberta) Ltd. trucks?

6. How will sludge be carried? There is a need for specially designed trucks.

7. With the expansion, how many loads per day are expected to be received at the plant? How many are received now?

8. There is a need for strict driver training, especially in the area of emergency response and for private operators/subcontractors. Who will be responsible for this and how will it be done?

9. To ensure safe driving conditions, drivers should be monitored for substance abuse and fatigue. How will this be done and by whom?

10. There is a need for emergency response contacts for the driver and the general public should an emergency occur. A response plan should be in place, with the crew of a vehicle being able to notify the shipper as soon as possible after an incident.

11. There needs to be a written contract between the shipper, the carrier, and any subcontractors covering emergency response and equipment standards responsibilities. It needs to be specific.

12. Who takes ultimate responsibility in responding to an emergency? What are their geographic areas of jurisdiction?

13. During the warmer months, the population of the cottage areas in Lac Ste. Anne increases. There is a corresponding increase in traffic along Highway 43. The approaches to the summer villages and cottage areas beyond Gunn are problematic with vehicles leaving and entering Highway 43.

14. Highway 43 can be treacherous to drive during the winter months due to bad weather. These conditions need to be addressed.

15. The routes proposed to be used by hazardous waste haulers are already heavily used to transport dangerous goods.

16. Highway 43 to Mayerthorpe from Gunn is narrow and Highway 33 is quite narrow; it does not have shoulders. Why is 85% of the hazardous waste traffic proposed for Highway 33?

17. Accidents occur along Highway 33 when people pass trailers. There are no places for trucks to pull over as they are being passed.

18. With 85% of the traffic proposed for Highway 33, there will be an increase in the likelihood of accidents. By distributing the traffic over several routes, the risk of accidents would be dispersed. This issue of risk equity has to be addressed.

19. Why is the present route used? Is it because it is the least costly?

20. The various routes need to be evaluated for a variety of factors - impact and adjacent populations, risk potential, current road geometrics and potential to be upgraded, impact on environment through which the routes pass.

21. How are the routes presently selected? Have the specific roads they are using now been identified and assessment done? it is important that drivers not be allowed to short-cut as they please.

22. Criteria needs to be established regarding the "overnighting" of loaded trucks. This would include identification of possible locations.

23. Routes throughout the Province, from point of pickup to Swan Hills, need to be defined.

24. A minimum amount of liability insurance needs to be defined for both Chem-Security (Alberta) Ltd. and its contractors.

25. School buses travel Highway 43 to and from Swan Hills for approximately one hour in the morning and afternoon. The increased risk of an accident involving a school bus as a result of increased traffic generated by the expansion of the facility has to be addressed. Mitigative measures need to be defined also.

26. The need to expand the facility and the subsequent need to transport wastes to the centre has to be justified.

27. A cost benefit analysis of pretreatment of wastes at regional sites and definition of possible implications for transportation should be done. Pretreatment could reduce the volume of waste shipped as well as its toxicity. This could have an influence on the number of trucks to be used to ship wastes as well as their design.

28. There needs to be a definition of mechanical standards to be followed by all carriers to ensure proper vehicle maintenance.

29. Procedures outlining how the security of loads can be ensured before shipping needs to be defined.

30. The vegetation bordering and adjacent to the routes needs to be monitored.

31. The municipalities bordering the proposed routes should receive help with the education and training of emergency response crews. As well, assistance should be provided for the purchase of emergency response equipment. The training and equipment purchase should not be the responsibility solely of the municipalities.

32. The use of additional facilities elsewhere in the Province to treat wastes should be evaluated as a way of reducing transportation risks.

33. The use of a rail connection to Swan Hills as a way of moving wastes should be assessed.

34. Does Chem-Security (Alberta) Ltd. have the same control over its contractors as it does over its own drivers?

35. Can the same controls be imposed through a contract bid?

36. Will the use of contractors increase with the expansion of the facility?

37. Have portable incinerators been considered?

38. Have or are alternative methods of treatment being considered?

39. Will there be an increase in the amount or percentage of wastes being treated at Swan Hills with the expansion, relative to the current situation?

40. Was the second phase forecasted?

41. What about the third phase?

42. Will expansion enhance the possibilities of regionalization? (of interprovincial waste transfer)

43. There is concern that Chem-Security (Alberta) Ltd. does not see itself as first responder to an incident. A carrier has to be a first responder in a remote area out of necessity.

44. Local fire departments are not trained or equipped to handle hazardous materials. Government agencies, such as ASWMC or APSS (Alberta Public Safety Services), should be responsible for the cost of training.

45. Municipalities are responsible to know how to access response teams.

46. The point (re: first response) must be made that this does not apply to just Chem-Security (Alberta) Ltd. but to all carriers.

47. Emergency responders must be kept fully informed along transportation routes at all times.

48. What is the estimated response time now of Chem-Security (Alberta) Ltd.?

49. Ways of reducing the impact of spills upon communities along routes needs to be fully addressed. This could include assistance (financial and otherwise) for training and education of emergency response teams, community awareness programs, and purchase/maintenance of necessary equipment.

50. There is a real need to identify and create places for trucks to pull safely off of the travel routes, especially on highway 33. This will be important as the traffic loading along these routes increase.

51. It is important that both real risk and perceived risk be treated appropriately in this assessment.

52. The need to define means and responsibilities of providing financial support to communities along routes for emergency response equipment, training, and education.

53. The need to establish standards for private carriers regarding training procedures, control over their activities while transporting wastes, and liability protection for the public at large.

54. The need to evaluate, justify and designate routes.

55. The need to review the possibility of including the route designation in the manifest.

56. The need to assess the effect of increased traffic on school bussing from communities along the designated route; an assessment of increase in risk of accident potential.

57. The need to review alternate modes of transportation to Swan Hills.

AIR QUALITY WORKSHOP REPORT

Concerns, Issues and Questions Raised

Facilitator's Note:

> The facilitator has taken the liberty of paraphrasing certain questions and/or eliminating those which were of a general nature. Hopefully, the following questions and statements reflect the major issues and concerns of the group. A list of written questions submitted to the facilitator at the conclusion of the workshop is the final item in this report.

Emissions

1. Regarding the concentrations shown on the maps - are these the largest expected concentrations?
2. Are you saying maximum concentrations will always be found within a 2 km. radius of the plant?
3. Are the existing stacks included in these calculations?
4. What is happening to trace/heavy metals in the incineration process?
5. What global impact does this have?
6. They should go further than 2 km. away from the plant.
7. What is the total impact rather than the concentration impact around the facility on an annual basis?
8. We should know the total amount of CO_2 on the environment in absolute terms.
9. We need to compare to other areas; the truck bringing the wastes to the plant expends as much CO_2 from the exhaust as the plant.
10. The concentration of PCBs is a concern at this time. Can we project what the ground concentrations will be in 5, 10, 15 years?
11. We need to know that the proposed emission limits are being complied with all and continuous monitoring is happening all the time, especially during emergencies. Are CFCs being analyzed at the present time?
12. What is the baseline and what effect does it have before adding to it?

13. Does it take into account dispersion at wind speeds?

14. What should be done if there were excursions?

15. This is the global impact of greenhouse gases and we should consider the production of CO_2, N_2O, CFCs methane.

16. What systems are being used in the plant to control emissions?

17. What is the long term commitment to reduce emissions over time?

18. When the original plant was built it was a good idea, but since that time there has been a global appreciation of what is going on in the atmosphere. Are we considering this concerning the current expansion?

19. There has to be some residue after incineration. What is being done with it?

20. I am concerned about is being disposed of in our back yards. Are we going to keep expanding in that location? Isn't that too much in one area? What are you going to do when all these cells are filled?

21. How many gases do we actually see and at what concentrations?

22. We must be forced to look into C02 going into the atmosphere.

23. Does the EIA say what monitoring programs will be in place once it is built?

24. Does quality assurance and environmental auditing come under monitoring?

Standards

1. What are these limits? Can we have something other than "we are trying to scrub as best we can"???

2. Whose standards are you using?

3. Have records been kept of what has gone down the deep well and how much?

4. The EIA should address the emergency response plan - environmental emergency affecting air quality, i.e. a fire in the plant. What affect would this have on air quality?

5. Will the recent model help in predicting concentrations?

6. Ground level monitoring - should there be any adjustment in the monitoring stack?

7. What is the validity for some of these very complex atmospheric models?

8. What if the government said we must reduce CO_2 emissions and one way to do it would be to shut the plant down? How much CO_2 is being put into the atmosphere?

9. It is important to describe emissions in layman's terms.

10. We need more than one scale - different people are interested in different levels, i.e. relative to location.

11. Performance levels should be communicated to the public.

12. Shouldn't it be a key issue to keep the public informed of the standards being used?

Process

1. Can you address the issue of whether this proposal stands on the best technology available?

2. Has any indoor testing been done in Swan Hills?

3. I heard all this 10 years ago. Maybe we need to say it all again for the EIA. The same concerns are there. let's state the concerns and then leave them behind us.

4. How do we identify those toxics that are truly recyclable but are not incinerated or disposed of in any other way? Why do we have to dispose of anything that is recyclable?

5. The incinerator plant was put together in the early 80s. Things have changed. Do we expand this in terms of what we know? We need an awareness of where the world is at.

6. The expansion should be placed in an historical context in the EIA.

7. As a result of this process, is it possible that either a smaller or bigger plant could be built?

8. When you added another incinerator last year why did you not have to go through all this?

9. What is the significance of the current Clean Air Strategy for Alberta review?

Written Submission

1. What is the relationship between the principals of
   a) TriMac
   b) Bovar
   c) Chem-Security and
   d) Western Research?

2. What are the environmental qualifications of the scientists and technical personnel working for: TriMac, Bovar, Chem-Security and Western Research?

3. What was the process that selected the Joint Venture Partner - i.e. Chem-Security, Bovar, Trimac, etc.?

4. What are the cost benefits involved in the original and expansion program?

5. What effect does the background baseline contamination have on the environment prior to the treatment plant start-up?

6. Why is there no detailed information on the Deep Disposal Well?

7. What does "waste water" mean on Figure 10, page 28 of the 1989 Environmental Protection Plan Booklet?

8. What are the comparative Base Line studies in other areas with a prior track record?

9. What are the global consequences of the original plant and expansion?

10. What are the criteria for selecting toxic organic products for re-cycling rather than incineration?

11. What is the validity of the mathematical models being used in dispersion, etc., in the light of uncertainty of global climate change models?

Submitted by:
J.R. Century, Chairman
Canadian Society of Petroleum Geologists
ENVIRONMENTAL GEOLOGY DIVISION

VEGETATION, SOIL, LAND AND WILDLIFE WORKSHOP REPORT

Concerns, Issues and Questions Raised

1. A feasibility study of the processing options considered should have been conducted, with each described and evaluated.

2. Can you fairly judge these issues (on vegetation, soil, land and wildlife) in a two-year period?

3. What kind of agriculture is there down-wind of the plant?

4. Is there a contingency plan if more PCBs are detected?

   - Will there be harm to vegetation?
   - Would the plant be shut down?

5. If new transformers do not produce PCBs what are the sources of PCBs today?

6. Are PCBs in Alberta destined only to Swan Hills?

7. If we are phasing out transformers/capacitors what are the companies who have in-service transformers doing about phasing them out?

8. What is the "Transformer Roaster"? Is it a wise investment?

9. What is the efficiency of the incinerators? (The existing and proposed).

10. What is the guideline for dioxin and furan emissions?

11. Does Alberta take PCBs from other provinces.

12. Regarding red-backed voles, who reviewed the protocols?

13. What kind of study other than on red-backed voles was done on other species?

14. What kind of study was done on red-backed voles?

15. Concern: That larger animals should also be studied (monitored) along with smaller mammals.

16. Are frogs and lizards monitored?

17. Have you considered monitoring further out, like 5 miles away?

18. Will we see more waste streams or less or the same because of the proposed expansion?

19. Can the plant accommodate extra PCBs?

20. What are the origins of sludges?

21. Is soil treated?

Transportation

1. Are all contaminated materials sent to Swan Hills through the operator?

2. Can an individual take their hazardous waste to Swan Hills?

3. What kind of waste oil is toxic?

4. In summer oil is poured on roads? What kind is it? Is there any regulation for this?

Air Quality

1. Whose limits did you use?

2. Has plant determined how much CO_2 is emitted into the atmosphere?

3. What contributions of acid rain content are there to the atmosphere?

4. How frequently do you monitor ground level concentrations?

5. Where are ground concentration samplings done?

6. Are there long-term projections from today's volumes?

7. What is the purpose of the stack? (40 meters stack height.)

8. What license limits do you have for the stack? Will they change with the proposed expansion? Will there be an increase in pollutants with expansion?

9. Has the plant treated mercury?

10. How do you establish the charge for treatment?

11. Are there subsidies per barrel from industries?

12. What are the anticipated sources of sludges?

13. Is municipal sludge a concern?

Fish and Wildlife

1. What types of monitoring is being done here?

2. What are your projections to carry on?

3. Is data available?

4. Are suckers monitored?

5. Deep well disposal -- is it a reliable practise?

Deficiencies in the Terms of Reference

- Government Mandate.
- Impacts of alternatives, such as increased reduction prior to disposal.
- More information on justifications, such as the quantity and source projections for sludges (in as much as the addition of sludge treatment was given as a reason for expansion).
- A better explanation of present operations, such as rationale for rocking kilns, third incinerator, proposed roaster for transformers (which will be declining).
- A broadening of impact studies to include synergistics, regional and global effects.
- Air quality - stack emission numbers and limits in both scientific and layman's language. An extension of monitoring sites to 5 km. and beyond.
- Impact of noise.
- Water monitoring could include amphibians such as frogs and insects. Provide an explanation for the choice of species monitored.
- Land classification and future land use should be added.

- A background study of the health of the community is needed.

- Reduction and recycling needs to be explained, i.e., how much is done at the plant and generally.

FISH AND WATER WORKSHOP REPORT

Concerns, Issues and Questions Raised

1. Early in the proceedings, one stakeholder concluded that the environmental threat from the proposed expansion would come from the increased volume of waste being transported and handled at the plant; but that the expansion would not have much of an impact on water and fish because there would not be "any enhanced drawdowns to the sandstone formation".

2. The group felt that the information presented on the monitoring program left too many questions unanswered. The unanimous conclusion - presented later to the plenary as a recommendation - was that the monitoring data for the EIA had to be presented in a clearer, more concise and understandable way.

   In some cases, the technical information was presented in the written materials without any context or explanation. For example, changes in the levels of arsenic, sulphates and sodium chloride were identified, but not explained. The group recommended that the "impact background to variations should be clearer".

3. Similarly, the experts did not explain why there was no monitoring of lake sediments, although they did monitor stream sediments. The group recommended that the monitoring program should present the total picture by examining threshold levels in sediments and by continuing to test indicator species (suckers) as well as the trout populations.

   "You need to present a perspective on values to show not only that the data has been collected but that it is properly interpreted and assimilated into the total picture. To say you did the work is only part of the battle - how you present it is important".

4. A geological expert in the group felt that not enough work had been done to assess the quaternary stratigraphy of the Swan Hills area. He was concerned about the impact of groundwater flow over geologic time. The group's recommendation was that the monitoring program should establish shallow groundwater flow patterns and their impact on regional groundwater flows - and look for connections.

5. The geologist's specific recommendations to be included in the Terms of Reference for the EIA are:

   "Surficial aquifers: assess local and semi-regional quaternary geology for aquifer geometries and flow patterns".

   "Deeper aquifers: perhaps a single measurement of water in the Cretaceous Wapiti formation is too modest a program. Swan Hills is an area of regional groundwater recharge and deeper aquifers should really be assessed".

6. The group also asked about the domestic water supply at the plant and the increased demand caused by the proposed expansion.

   The group recommended that Chem-Security (Alberta) Ltd. should address in the EIA the water consumption requirements and the impact of using more groundwater.

SOCIO-ECONOMIC WORKSHOP REPORT

Concerns, Issues and Questions Raised

Corporate/Government Impacts

Macro-Economic System Issues

The Terms of Reference should deal with the macro-economic system, impacted by the Alberta Special Waste Management Corporation, its operations and its expanded support systems.

The following issues should be addressed:

1. The total special waste management system and the full scope of system components - including transportation etc.

2. Total costs and benefits.

3. The macro-economic system impacted.

4. Impacts on customers, generators of waste, etc.

5. Economic opportunities to the Province - including education.

6. Clarification of the economic/market analysis of the total system and how uncertainties are to be managed.

7. Clarify how Alberta will benefit economically in the global market placa.

Corporate/Project Clarification

The following issues should be addressed:

1. Priorization of what wastes will be managed by the plant in relation to current regulations and other guidelines.

2. Clarify agreements in place and those projected to mitigate impacts throughout the system.

3. Clarify the costs of decommissioning, i.e., cleaning up the site following the 25-year lifeline.

4. Clarify who is responsible for reclamation (upon closure) and what guarantees are in place.

5. Justify the concept of incineration to the public.

6. Establish how the incinerator will be monitored, upgraded and adjusted as required.

7. Based on a review of potential conflicts of interest, clarify and change where required, the relationship between the Alberta Special Waste Management Corporation and Chem-Security (Alberta) Ltd.

8. Who is liable for pollution and insuring against it?

9. The current level of ongoing community education is positive and through expansion is expected to build positive relationships.

The Project Review Process

The following issues should be addressed:

1. Given recent experience in Alberta related to environmental reviews, there is a need to establish a hearing process as part of the project review process pending the creation of the Natural Resources Conservation Board.
2. Clarify native contacts and consultation in the project review process.
3. Clarify the ongoing public information and consultation process.
4. There is a need to review the consultative review process regarding: hearings, intervenor funding, and independent assessment, with special attention to native communities and treaty rights.
5. Do treaty rights have to be reviewed through an Environmental Assessment Review Process (EARP) to get proper attention?
6. Is the Corporation a "global corporation"? In what way can global impacts be reviewed, e.g., the EARP review process?

Economic-Employment Impacts at the Local/Regional Level

The following economic-employment impact issues should be addressed:

1. The impact of the total system expansion on the local/regional economy.
2. Clarify how monitoring/review of economic costs/benefits will be undertaken.
3. The economic impact on local/regional systems, e.g., education.
4. The impact on community wellness in relation to health, the job market, job creation, local employment and the fit between employment and local services.
5. The impact of development on the tourism sector.
6. The impact of transportation of the Alberta Wildlife Park and regional development.

7. What portion of labour, fabrication, etc. will be done in Alberta and in the local/regional area?

8. What will be the cumulative impact of development - pulp mills, logging, tourism, etc. - on the Athabasca River and wildlife?

9. Maximum benefits should be directed locally, then to the region, e.g., purchasing, hiring, taxation, etc.

10. Review the taxation burden on existing local taxpayers.

11. Will relocation special allowances be available?

12. Clarify the overlapping federal and provincial jurisdictions with respect to hunting, fishing, trapping, gathering and aboriginal rights in the two treaty areas. How does this impact on the development proposal?

Population Impact and Social Conditions

The following issues should be addressed:

1. The impact of increased population on community services: housing, educational and medical services, the infrastructure, and community well being.

   - It was noted that the population influx immediately increases the strain on certain services such as school busing as well as immediately increasing the risk of accidents, crime etc.

2. The lack of services is made more critical by outside influences and increased demands.

3. Review in-migration and out-migration impacts.

4. Review the impact of construction on the population.

5. Establish proper monitoring (based on Alberta experience) of social conditions i.e. population fluxes, social changes.

6. Establish who benefits from these changes and how.

7. Clarify how the implementation of policy and programs can be improved.

8. Clarify social impacts/mitigation, e.g., crime, changing social conditions.

9. The plant expansion will increase the local population. The regional native population will be affected by this population's impact on wildlife and game in the area. Clarify who will provide coordinated mitigative management regarding this issue.

10. Who is responsible for coordinating mitigative management regarding the socio-economic impacts of this expansion recognizing their inter- jurisdictional nature?

11. Investigate potential on-the-job health risks for women: explore how the findings can be used to help set guidelines for the employment of women.

12. Provide employment equity programs for women and the local native population: establish appropriate systems to ensure the effective implementation of such affirmative action programs.

Indirect Impacts

The following issues should be addressed:

1. Clarify a local/regional process to assist area residents and businesses in developing plans and initiatives relating to the proposed expansion.

2. Clarify the downstream/regional impacts that will affect sensitive communities and the environment, i.e., the native population, wildlife and the food chain.

HEALTH RISK ASSESSMENT WORKSHOPS REPORT

Concerns, Issues and Questions Raised

Health Risk Assessment and Monitoring

1. Concern that there is no baseline data from the beginning, i.e. before construction of the original plant. This baseline data would include data at the community level.

    - a supplementary concern is that the area covered by the baseline studies be sufficiently broad.

2. Exactly how are the health risks for employees determined and what yearly assessments are conducted?

3. What are the scope and methods of the Health Impact Assessment?

   - would like to see the model used for the health risk assessment.

   - would like to see more on human health risk assessment (more than what was sent out under Occupational Health and Safety in the material provided to participants).

   - you need to do a risk assessment of start-up procedures, and of any situations during a transition stage.

4. What mechanism does the corporation have to respond to health concerns as they arise?

5. What data will you collect in health monitoring activities? When adverse effects are measured, what will you be looking for (for both employees, their families and the community)? Have you considered synergism?

6. What process will be used to establish exposure limits? What will you do for chemicals which have a zero threshold?

7. How were the 40 products of combustion chosen, especially given the uncontrolled intake of waste streams?

8. What health and safety procedures for employees are in place? This would also extend to other employees who might become involved with the plant - i.e. concern for the volunteer fire department in Swan Hills.
   What training procedures do you have for all these types of employees?

9. Who audits the plant's health and safety procedures? An external firm would be better - this is done by 'excellent' companies.

10. What monitoring will be in place for offsite movement? What health and safety procedures and training will be in place for personnel involved in waste transportation and transfer?

11. Concern for how long it took to get the health impact assessment in place.

    - monitoring of voles was done prior to people - plant personnel appear to have been the last to be monitored.

    - baseline monitoring must be in place before the plant starts at all.

    - given timelines, it appears that decisions will be made and construction started without an adequate level of health impact information.

12. Concerned about the amount of knowledge we have about health risks of many of these compounds in any case - especially to give us guidance for what we're looking at and what we should be looking at.

13. Is data available on the health of employees? Is health monitoring of employees ongoing? Is any allergy testing done for employees?

14. Would like to see the PCB study which has been conducted. Would be particularly interested in whether it covered any other substances.

15. We need some mechanism for identifying those things we can address in a constructive manner, and those things we really can't.

16. What process will be in place for reassessing exposure limits over time - and will they be adjusted as the need arises?

17. Who analyzes the data? i.e. of the 3 indicator groups, of other health data.

18. Is it possible to set up an independent group apart from the government and from industry, that could be available to communities and to community groups. This group would include professionals from industry and from the community at large, and would be available to communities to help interpret the information being provided by a company, and highlight whether "the community is being lied to".

19. Concerned because the approach being taken is not an ecosystem, holistic approach - everything is developed and presented in pieces, but in reality everything interacts.

20. Would like to see data available regarding what is going up the stack and how much is going out the stack (both now and for the projected expansion).

21. Are plant personnel getting the NIOSH 40 hour training course for hazardous waste personnel or its equivalent? (Understand that this is the requirement of hazardous plant workers in the US and that this is being increased to 80 hours in the USA).

22. The broad definition of health should be used, and the understanding that health status is affected by the environment, etc. (this would then interact with the socio-economic analysis on impact on families, other social supports).

23. What type of data does Chem-Security (Alberta) Ltd. have available compared to other hazardous waste facilities?

24. What sort of turnover is there at the plant?

25. Is there a termination medical as well as a pre-placement medical?

26. Re the statement that "State of the art" equipment is being used in the proposed plant expansion. What does state of the art mean?

27. Process issues are a concern - would like more information on the plant process, likely areas for problems, etc. It was a frustration that actual plant processes were not noted in the literature sent out.

28. Would like to see a study designed that would do a better job than the 'traditional' studies. The use of an Advisory Committee would be helpful in the design and conduct of the study.

    - you should look at what other technology is being used and the effect of new technology found in other parts of the country or the world.

    - it is very important that the positive be reflected - the corporation must be very open.

29. Re monitoring of "real people" - what is being proposed?

    - look at the families of employees (monthly basis perhaps, more frequently depending on what's going on at the plant).

30. There is an opportunity to design a useful health impact study, with a design that is more useful than the traditional types of studies (caveats were noted re the need to have an acceptable protocol to the scientific community, and the difficulty in finding an adequate control group for a cohort study, given the demographics of the Swan Hills area, and the fact that these would provide results only in the long term).

- there would need to be some preliminary work re what you would constructively look for.
- perhaps this should not be the corporation alone, but supported by Alberta Environment and Alberta Occupational Health and Safety as well.
- information could be marketed as part of Environmental Health technology.
- use information from other facilities. Even though they are not in equivalent areas, they would give some direction regarding areas to pursue.
- noted that this is long term work - would not be in the EIA. (though the protocol and plans might be included in the EIA).

31. It is important to take the broadest possible view, in order to make more public comfort - people get most anxious when they see a tunnel vision approach.

- work with a think tank over time - people know there are risks to life and you are breaking new ground. What they need to be comfortable about is that you have a process in place to look at the situation on an ongoing basis, in order to watch for and respond quickly to situations which develop. (including the conviction to stop operating the plant in 10 years if the information does start to indicate a problem).
- congratulations to the people of Swan Hills for being prepared to take the risk and be a part of this - but don't play with their health.
- the community won't blame you if , over time, it becomes clear that the decision was in fact wrong - provided you are open and honest about it.

32. We still need short term information to aid in the decision as to whether to proceed with construction.

- is this new technology being used elsewhere? If so, analyze that data.
- is there better technology?
- is the real criteria for decision the most feasible technology or the most financially attractive solution?
- is health a factor in the decision?

33. Clarify the purpose of the biomonitoring program. Ensure that Environmental Health is it's purpose (i.e. health of humans and the environment).

34. You need to check that you aren't wasting time and money looking at the wrong things.

35. The consultation process today would have flowed better if the group had specific/detailed information regarding the Health Assessment model, what information had already been analyzed, etc. The current document isn't helpful - "it talks about lichens, not about people".

36. Note that the answers to the questions raised here today will raise more questions in some areas.

37. Canadian Public Health Association has held some workshops to develop some models for guidance in Health Impact Assessment that you should consult.

38. Can you not provide information on what waste has gone through the plant in the last few years, to provide some guidance on overall types of waste, to provide at least a start on areas for health assessment, health monitoring? There is confusion between two apparently contradictory statements - that you can't tell what someone is going to be exposed to, and that you analyze everything when it arrives so you can determine protective equipment needed.

39. What procedures are in place for employees not usually wearing personal protective equipment? i.e., office staff during a quick upset.

40. Why is there only one air monitoring station?

41. What variables in relation to health-risk monitoring should we be looking at; what needs to be monitored at the townsite in conjunction with what is monitored at the plant site; what about people involved with transportation. How big is the scope going to be? The company needs to be looking at issues off-site as well as on-site.

42. How do you select a particular group for human health monitoring? How are exposure limits established for children 2-4 years? Have you considered taking samples of blood levels at time of birth? Should we not be doing specific human health monitoring to population at most risk, i.e., families of workers. Need to identify chemicals of greatest concern.

43. What type of monitoring is in place for deep injection well, other than surface monitoring? What about materials going into the deepwell. Is there a potential for long term health risk?

44. As a result of monitoring, could you produce a yearly report which would include results of human health monitoring, extended to include health risk assessment trends? Need to start baseline for targeted population for targeted chemicals.

45. What about health risks associated with transportation, what about training for doctors, including Medical Officers of Health, do they have information? Is information available to RCMP, firemen, etc.? Are they aware of what Swan Hills deals with?

Risk Communication

1. Will you have information available to interpret the results of the health risk assessment study and of the ongoing monitoring program to the citizenry at large? This information will need to be in an appropriate form so it is understandable.

2. Corporations must get more aggressive about interacting with the communities. They must provide unbiased information, on issues that the community is interested in. This information is critical so we can begin educating the public.

3. Is it possible to set up an independent group apart from the government and from industry, that could be available to communities and to community groups. This group would include professionals from industry and from the community at large, and would be available to communities to help interpret the information being provided by a company, and highlight where "the community is being lied to".

4. As a result of monitoring, could you produce a yearly report which would include results of human health monitoring, extended to include health risk assessment trends. Need to start baseline for targeted population for targeted chemicals.

5. What about health risks associated with transportation, what about training for doctors, including Medical Officers of Health, do they have information. Is information available to RCMP, firemen, etc. Are they aware of what Swan Hills deals with?

ASWMC in the System, and the EIA Process

1. The EIA really needs to be conceptualized on an ecosystem approach rather than the approach that is now used. There are models available for this approach.

2. Concern that because the legislation is not in place, they aren't sure of the criteria that will be used for the EIA. They are also concerned about where their input will go - will it be considered?

3. Not convinced of the need for the plant itself - see little effort (though much talk) of the 3 R's.

4. Will there be any waste energy? If so, what plans are there for utilization of it?

5. Concerned because the approach being taken is not an ecosystem, holistic approach - everything is developed and presented in pieces, but in reality everything interacts.

6. If Alberta Environment is regulating the plant, why are they not here? Public Safety Services? (Note that Occupational Health and Safety was in one workshop and Alberta Health was in the other health workshop).

7. Will the scope of the EIA be limited to just Swan Hills? How will it impact on other areas of the Province? Concerned about the discrepancies that exist in environmental monitoring in her area (i.e. illegal disposing of hazardous waste). Would like to see a more coordinated approach to ensure people are aware of the procedures in exporting waste and methods of transportation used. She identified the need to have a bigger scope of networking in the province. Concerned about inconsistent and incomplete legislation/guidelines.

8. What will happen if the Swan Hills expansion does not take place? We are already backlogged with stockpiling of hazardous waste. Will we have a larger problem to contend with?

Areas of Agreement

1. The ASWMC ran a course for communities. This was very useful and needs to be expanded and intensified. We need to do a better job of educating our communities, and community representatives need to have more and more "user friendly" information about the technical aspects in order to pass it on better.

2. The separate treatment of occupational health and safety in the Environment Protection Plan was appreciated, although more detail would be appreciated.

3. Appreciated that the company is collecting at least some baseline information before the addition is started - 10 years ago this wouldn't have happened.

Recommendations

1. Provide more information about the technology of the plant. This must include detailed information on the plant process, what goes in (on average), and what comes out.

2. An explicit health impact assessment and plans for health monitoring need to be included in the EIA.

   - In terms of the plan for ongoing monitoring, this is an opportunity to develop new research methods and to develop a reliable database on health effects.

   - There must be targeted monitoring of health impacts on key groups - i.e. workers and workers' families, although in some cases, community monitoring will be required as the most sensitive indicator.

   - Health monitoring needs to occur at all stages and for both normal and emergency situations.

   - The report needs to comment on the validity and interpretation of current published exposure limits for acceptable exposure to various elements - for both the general public and for employee exposure.

3. An ongoing consultation process is desirable, and there is a need to develop a risk-communication program for human health status reporting. This risk communication program should proceed whether or not the plant expansion proceeds.

4. A holistic/ecosystem view must be taken to the EIA.

5. Answers to the questions raised in the 3 sections of areas of concern (or a description of the process that will be used to provide the answers) would be helpful in the EIA. There is concern about where our input fits and whether it will be listened to.

6. Training is required for personnel in all parts of the system. The plant, transportation sector, transfer stations and other personnel who could become involved (e.g. fire fighters).

APPENDIX A

DRAFT TERMS OF REFERENCE

- A review of the mandate of the Alberta Special Waste Management System (ASWMS)

- The ASWMS - a progress report, 1987 to today
    - History of the Centre
    - Site Selection Process
    - Environmental Regulatory Approvals
    - Project Facilities

- Why must the Treatment Centre expand?
    - Purpose
    - Approach
    - Justification

- In what way may the Treatment Centre be expanded? What are the treatment options?
    - Technical Solutions Options Evaluation Matrix-The Pros and Cons

- Operations at the Treatment Centre today
    - Project Facilities
    - Design Concepts
    - - total containment
    - Waste Transportation
    - - routes
    - - risks
    - Treatment Centre
    - - infrastructure
    - - incinerators
    - - physical/chemical treatment
    - - stabilization
    - - secure landfill
    - - injection deepwell
    - - storage and processing
    - - transformer preparation area
    - - transformer roaster
    - Auxiliary and Utility Systems
    - - roads
    - - electrical supply
    - - natural gas supply
    - - water supply and treatment system
    - - truck wash facilities

- What areas of the environment may be affected by the Treatment Centre's operations as they stand today?
  - Water Quality
  - Air Quality
  - Soil and Vegetation
  - Wildlife

- How are these areas affected?

  Climate and Air Quality
  Existing Conditions
  - gases
  - particulates
  - noise

  Residual Impacts

  Water Resources
  Existing Conditions
  - surface water
  - groundwater

  Residual Impacts
  - drainage patterns
  - water quality

  Surficial Geology and Soil
  Existing Conditions
  Residual Impacts
  - excavation
  - burial
  - alteration of local landforms

  Vegetation
  Existing Conditions
  Residual Impacts
  - clearing
  - drainage pattern changes
  - air emissions

  Wildlife
  Existing Conditions
  Residual Conditions
  - habitat loss
  - disturbance

Fish and Aquatic Resources
Existing Conditions
Residual Impacts
- habitat loss
- water quality

Resource Land Use
Mineral Resource Extraction
Forestry
Wildlife and Fish Harvesting
Trapping
Recreation

Historical Resources
Existing Conditions
Residual Impacts

- How are the people living around the Treatment Centre affected?
  Existing Conditions
  Residual Impacts
  economy
  housing
  services

- How are the employees of the Treatment Centre affected?
  Safety Standards

- What treatment option is the operator of the plant proposing to expand the facility's capacity? Why?
  Description of Expansion Facilities
  Design Concepts
  Waste Transportation
  - routes
  - risks
  Treatment Centre
  - infrastructure
  - large rotary incinerator
  - stabilization plant
  - secure landfill
  - storage processing areas
  Auxillary and Utility Systems
  - roads
  - water supply
  - truck wash facilities

- What are the proposed emission limits and why were these selected?

- How will an expansion of this kind affect environmental quality?
  Air Quality
  - mitigative measures
  - potential impacts

  Water Resources
  - mitigative measures
  - potential impacts

  Surficial Geology and Soil
  - mitigative measures
  - potential impacts

  Vegetation
  - mitigative measures
  - potential impacts

  Wildlife
  - mitigative measures
  - potential impacts

  Fish and Aquatic Resources
  - mitigative measures
  - potential impacts

  Resource Land Use
  - mitigative measures
  - potential impacts

  Historical Resources
  - mitigative measures
  - potential impacts

  Summary of Impacts

- How will the proposed expansion affect the people who live around the plant?
  Mitigative Measures
  Potential Impacts

- How will the expansion affect the employees of the Treatment Centre?
  Safety Standards

- What/How will the Public be involved in the review of the proposed expansion?

- What will the operator of the Treatment Centre do to minimize potential adverse affects of such an expansion?
  Environmental Protection Plant

- What material was used to form the basis of some of the operator's arguments?
  Literature Cited

- What happens years from now when the plant site is closed?
  Site closure and post-closure monitoring

APPENDIX B

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